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Efficient Poultry Inspection Service

(Complete Index on Page VIII)

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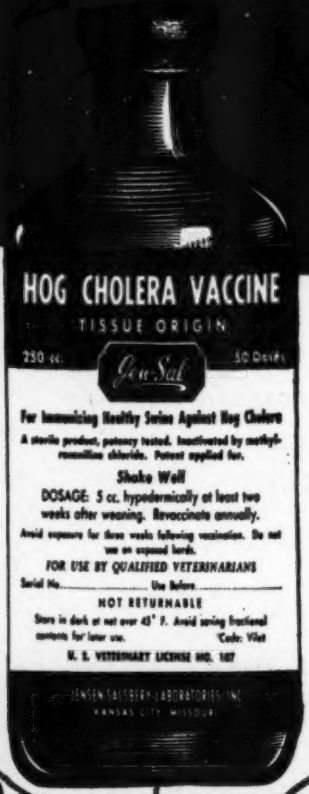
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Vitallium Bone Plating In Dogs: Description Of A Practical Technic And Clinical Observations

C. I. CHAPPEL,* D.V.M., and JAMES ARCHIBALD,* D.V.M., Guelph, Ontario, Canada

THE use of metallic plates for fracture reduction is a technic which the authors feel is being neglected in small animal veterinary practice. Recent textbooks on small animal surgery and even those on human surgery make only brief mention of this surgical procedure. A review of the literature indicates that most of the prejudice against the use of metallic plates stems from unsatisfactory results published prior to the development of modern antibiotic therapy. In view of this, an attempt has been made in the Small Animal Clinic at the Ontario Veterinary College to apply the technic in a number of selected cases, aided by strict asepsis and judicious antibiotic therapy. The results have been encouraging.

Metallic plates can be used successfully in simple diaphyseal fractures of the long bones, but the method is particularly applicable to the following pathological conditions:

1. *Simple or Compound Fractures of the Tibia and Radius and Ulna.* These bones appear to be the most common site of nonunion. Fractures are usually present in the distal third of the bone, while the blood supply is in the proximal third. In addition, these bones are not encased in heavy muscle tissue, and red bone marrow is absent except in the proximal extremity. These three factors are believed to predispose these bones to slow healing or nonunion; hence the positive permanent fixation provided by metal plates is advantageous.

2. *Fragmentation Fractures where a Firm Support to which Large Pieces of Bone may be Fixed is Desired.* As in (1), the permanent fixation obtained by using metal plates will aid healing.

3. *Fractures which have been Unsuccessfully Treated by other Types of External or Internal Fixation, resulting in Nonunion and Pseudoarthrosis.* If plates are carefully applied, after debridement of the fracture line, good functional results can be expected. In this type of fracture, the use of cancellous bone transplants will also aid reunion of the ends of the bone.

Materials and Method

The following points of technic must be borne in mind when open reductions and internal fixation of fractures are being performed:

1. Strict asepsis.
2. Control of hemorrhage.
3. Careful debridement of dead or devitalized bone or soft tissue.
4. Coaptation of muscular tissues to cover the plates applied to the fracture.
5. Adequate antibiotic therapy.
6. In the case of compound fractures, careful cleansing of tissues with sterile saline, and mechanical removal of foreign material and bone fragments.

For successful plating, it is essential that the veterinarian make use of the routine equipment which is a prerequisite of aseptic surgery. Caps, masks, gowns, and gloves must be worn by all those taking a direct part in the operation. Adequate draping material must be provided.

The accessories may be sterilized by autoclaving, and the instruments, plates and screws may be boiled or autoclaved. Any disregard of these essentials increases the hazards of the operation to such an extent that the technic is not feasible, while rigid adherence to these rules will be rewarded by gratifying results in a high percentage of otherwise difficult cases.

The Sherman type vitallium plate and self-threading screws seem appropriate for use in dogs. This type of plate combines strength with a slight malleability so that if necessary it can be bent to conform to the contour of the bone being plated.

Pentobarbital sodium is the anesthetic of choice for small animal fracture reduction at the Ontario Veterinary College. It is felt that greater relaxation of muscle tissue is obtained with the use of this type of anesthetic than would be possible if a volatile type were used.

*Department of Small Domestic and Fur-bearing Animals, Ontario Veterinary College, Guelph, Ont., Can.

Preparation for Surgery

For two days prior to the operation, procaine penicillin is administered to the animal in adequate dosage to ensure a therapeutic blood level of penicillin during and after surgery.

The operational site should be clipped and shaved the day before the operation. The skin should be scrubbed with soap and water and an antiseptic pack applied over the area. Prior to the operation, the skin is again scrubbed with soap and water, using a soft brush. This is followed by the application of alcohol (70%) which is then dried and tincture of iodine applied. The cleansed area is then isolated from unshaved areas by towels applied around it and attached to the skin by Backhaus' clamps. A second draping is applied over the first. This second draping covers the entire area except the incision line.

Operative Procedure

A lateral approach to fractures of the long bones is preferred. By this method, the protection afforded by the musculature can be used to full advantage.

The skin incision should be generous as it is inconvenient to have to withdraw from the deeper tissues later and enlarge the skin incision. If the fracture is compound, it is wise to avoid the dermal perforations if possible and make the skin incision through healthy tissue. The incision may then be expected to heal by primary union while the wounds created by the fracture are allowed to drain and heal by second intention.

All bleeding vessels are clamped and ligated and the skin towels applied. The latter are clamped or sutured to each side of the incision so that all the external surface of the skin is hidden from view. The exposure of the bone may then be accomplished with a minimum of hemorrhage, by taking advantage of natural cleavage lines between muscle sheaths, and by using blunt dissection, the fracture line can usually be exposed without difficulty.

The area is then explored for bone chips. These are removed. The fracture ends are debrided, if necessary, taking care to leave the periosteum intact wherever possible. Extension is next applied to bring the fractured ends into apposition and the plate is fitted to the site. The bone and plate are held in position by a bone clamp (Lowman's) and holes of slightly smaller diameter than the screws are drilled through the bone. The screws are then inserted. They should pass through the medulla and just penetrate the opposite cortex.

Hemorrhage about the site of the fracture is essential to hematoma formation, so that in its control one can be overzealous. Of course, visible welling of blood about the site should be controlled, but hemorrhage from the drilling of the bone and from the currettage should be left to form a hematoma and later organize as the basis of primary callus formation. Tampons of gauze or fibrin foam may be used to control bleeding from the soft tissue. Fibrin or gelatin foam may be left in the wound, but clinical observations have shown that such hemostatics will delay bony union.

The muscle and fascial sheaths are then opposed and closed with chromic catgut no. 1, using a simple, interrupted suture. The skin is closed, using any reliable nonabsorbable suture material. Before final closure is made, 300,000

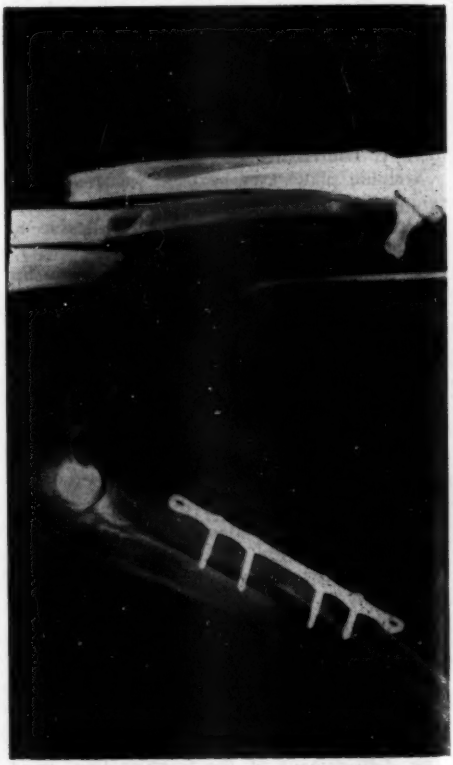

Fig. 1. Case 1. (upper)—X-ray taken when the dog was admitted to the Clinic. This splint which the animal was wearing had not yet been removed. (lower)—X-ray taken after the fracture had been plated. The small splinter was not removed.

units of crystalline penicillin are injected into the incision line and between the muscle sutures.

Supplementary external fixation of the leg is recommended for a period of one to two weeks postoperatively. Plaster casts may be used for this purpose, but generally modified Thomas splints are quite adequate and have the advantage of permitting better observation of the incision.

Clinical Observations

Following is a short resume of a cross section of the cases on which vitallium plates have been used at the Ontario Veterinary College during the past eight months.

Case 1. A Newfoundland dog, male, 1½ years of age, in good general condition, and reported to have been immunized against distemper, was brought to the Clinic. The animal was suffering from a transverse simple fracture of the radius and ulna with overriding of the fractured segments. A plaster and wire cast was worn on the affected leg.

The leg was radiographed (fig. 1) and reduction of the fracture judged unsatisfactory. The same day the cast was removed, revealing a small pressure sore at the carpus. This was treated and the area over the fracture shaved and an antiseptic pack applied. Procaine penicillin (300,000 units) was given.

The following day, a plate was applied under morphine-nembutal anesthesia (fig. 1). The small splinter which was present was not removed. It did not develop into a sequestrum nor impede healing.

Fig. 2. Case 2. (upper)—X-ray showing the Thomas splint which the dog was wearing when admitted. The large fragment proximal to the surface line was later removed.

(lower)—X-ray taken after the vitallium bone plate had been applied.

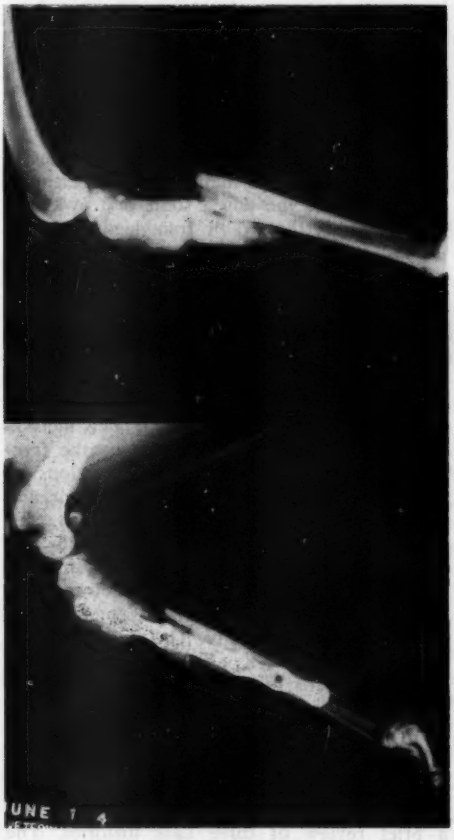

Fig. 3. Case 3. (upper)—X-ray taken one week after the leg had been fractured.

(lower)—X-ray taken two weeks after the fracture had been plated. Drainage was evident at this time.

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Recovery was uneventful. Healing of the incision was by primary union. Penicillin therapy was continued for four days. Nine days after the operation the dog was walking of its own accord on the affected limb, and on the 11th day was discharged.

Case 2. A Welsh terrier, female, aged seven months, was presented to the Clinic with multiple fractures of the pelvis and a simple, midshaft, transverse fracture of the left femur (fig. 2). Treatment for shock was instituted on admission. On the third day after admission, an open reduction was performed on the femoral fracture and an intramedullary pin inserted. No surgical treatment of the pelvic fractures was attempted.

At the end of five weeks, the intramedullary pin was removed and evidence of nonunion was apparent. Callus formation was slight and calcification was absent. This case of nonunion was later attributed to the use of fibrin foam packs about the fracture line.

Two weeks after the pin was removed, a second open reduction was performed and the bone was plated (fig.2). Functionally, the results were good; the malformation present in the pelvis gave the dog a somewhat awkward gait but nevertheless all four legs could be used.

Case 3. A male Collie dog, 16 months of age, was presented to the Clinic with a compound fracture of the right tibia (fig. 3). The fracture had been present for seven days, unaccompanied by any form of immobilization.

An open reduction was performed and a vitallium plate applied (fig. 3). The incision and the skin perforations caused by the fracture were infiltrated daily with solutions of crystalline penicillin. The operative incision healed well while the skin perforations continued to drain for three weeks after the operation. X-rays revealed the presence of osteomyelitis about the site of the fracture. This was controlled by the use of penicillin and streptomycin parenterally. The dog started to use the leg five weeks after the operation and then was discharged.

Summary

A clinical report on vitallium bone plating in dogs as used in the Small Animal Clinic, Ontario Veterinary College, is presented, with a brief review of three case histories. The success which has attended the use of this method of fracture reduction at this clinic will, the authors hope, stimulate consideration for, and criticism of, its use by the practicing small animal surgeon.

Uniformity of Milk Sanitary Regulations

The Public Health Service has been promoting uniformity in state and local milk sanitary regulations since 1923 when its recommended milk ordinance was first introduced. Today, nearly 60,000,000 Americans reside in areas which have voluntarily adopted this ordinance.

Unfortunately, some communities have failed to see the wisdom in the provisions of the standard milk ordinance and the legal contest on the constitutional validity of the local regulations in force at Madison, Wis., is the case in point.

Recent decision of the Supreme Court of the United States invalidates provision of the local ordinance of Madison restricting the sale of milk not pasteurized within five miles of the city center. In this case, the Court vacated judgment and remanded to the Supreme Court of Wisconsin the case of the Dean Milk Company of Illinois versus the City of Madison. In reaching its decision, the court found that Madison, even in the exercise of its unquestioned power to protect the health and safety of its people, cannot, by its ordinance, discriminate against interstate milk shipments if reasonable nondiscriminating alternatives are available.

The Court pointed out two such alternatives: (1) the city may rely on its own officials for inspection of distant milk sources and charge the cost of the inspection to importing producers; or (2) it may adopt the Milk Ordinance and Code recommended by the Public Health Service, which imposes no geographical limitations on milk sources, but excludes milk not produced in conformity with standards recommended.

▼ ▼ ▼

Infectious Equine Encephalomyelitis in the United States in 1950

During the calendar year 1950, 1,023 cases of equine encephalomyelitis were reported from 23 states. This is the lowest number recorded for any year since the BAI began making annual surveys of the disease.

The average mortality was 41%; considerably lower than the record 60% reported in 1949. In 1949, Louisiana reported an outbreak with 1,525 cases; in Arkansas, 192 cases were reported. No infection was recorded in either of these states in 1950, and in five of the geographical areas the incidence of the disease ranged from 60 to 90% less than in 1949. The peak month was September.

New Developments In Chemotherapeutic Agents

LEWIS E. HARRIS,* M.Sc., F.A.I.C., Lincoln, Nebraska

PART II†

ANTIHISTAMINES

THE antihistamines were first used in human medicine to control various allergic manifestations such as hay fever, certain types of asthma, urticaria, certain forms of dermatitis, etc., and more recently have been widely publicized for relief of symptoms of the common cold. These drugs have a useful place in veterinary medicine.

Histamine occurs in all tissues; generally in a combined form. It may be liberated by allergic substances with resultant contraction of smooth muscles of the bronchioles, vascular system, uterus and intestines. The release of histamine may also cause stimulation of secretions of nasal, pulmonary and lacrimal glands, dilation and increased permeability of capillaries of the skin, and production of pain or pruritus through action on terminal nerve endings in the skin. The action of liberated histamine is responsible for many of the symptoms of asthma, hay fever, etc. Therefore, to relieve the symptoms of an allergy it is necessary either to remove the causative agent or antigen, or to block the action of histamine. The antihistamine drugs are quite effective in this blocking action, and provide effective relief from symptoms.

Veterinary Uses. Fair to good results are reported by Rawson[17] and Schaffer[18] in treatment of allergic dermatitis, urticaria, asthma (cough), pruritus, conjunctivitis and control of anaphylaxis in dogs. Sweet, *et al.*,[19] and Rawson[20] have suggested the use of antihistamines in equine and bovine laminitis, azoturia, summer sniffles (bovine), acute pulmonary edema (bovine), toxemia associated with retained placenta, and metritis (bovine), overloaded rumen, bovine stomatitis, bee sting, and toxic indigestion (bovine). Some practitioners have reported satisfactory use of antihistamines parenterally in milk fever cases, particularly in relapses following standard calcium therapy.

Dosage. There are a number of different antihistamines, but most of them have approximately the same dosage. These drugs are available in tablet form for oral use in small animals, in solution for parenteral use in large animals, and as an ointment for local application. The average dose for small animals is 25 to 75 mg. orally two to four times daily, depending upon size and condition of animal. Large animals; 300 to 600 mg. (usually as a 2% solution, *i.e.*, 20 mg. per cc.) intravenously or intramuscularly, repeated every six to 12 hours as indicated. Intravenous administration should be made slowly since there is occasionally marked temporary stimulation.

ENDOCRINE PRODUCTS

The use of endocrine products in veterinary medicine is increasing rapidly. In the past, much confusion has existed because the veterinarian deals with several different species and because of the questionable value of some published reports in which there has been faulty interpretation. Endocrine therapy in veterinary medicine, at present, is largely concerned with correction of reproductive disorders, influencing economically important functions such as egg and milk production, use of hormone implanting for poultry and turkeys, and increasing growth and fattening of livestock. Only a few of the endocrine products in use will be discussed here.

Chorionic Gonadotropin

Chorionic gonadotropin is the water-soluble gonadotropic substance obtained from the urine of pregnant women. Usually supplied in a vial containing 10,000 international units (I.U.). A vial of diluent is normally supplied in the same package.

Veterinary Uses. Principally in the treatment of nymphomania due to cystic ovaries and in crytorchidism.

Dosage. Nymphomania in cows and mares; 10,000 I.U. intramuscularly; one dose is usually sufficient. Cryptorchidism; use 250 to 500 I.U. every other day for seven to ten days for

*Director, Pharmaceutical Research and Control, Norden Laboratories, Lincoln.

†Part I appeared in VETERINARY MEDICINE, June 1951, p. 208.

horses; 250 I.U. twice weekly for six to eight weeks for dogs.

Dienestrol

Dienestrol is a synthetic estrogen designed for treatment of cows that fail to settle in spite of frequent services and in the absence of pathological conditions or anatomical abnormalities. It is rapidly absorbed and excreted. Dienestrol preparations supplement ovarian estrogen production during estrus, thus providing the necessary stimulation to the maturing follicle to induce ovulation and corpus luteum formation.

Dosage. Administer subcutaneously 5 mg. dienestrol as soon as the cow has come in heat. This will be sufficient in most cases, but for large animals of sluggish temperament 10 mg. should be used. Twelve to 24 hours after injection, the cow should be bred. In cases of long standing infertility, it is well to repeat the treatment on successive heat periods if conception does not occur.

Diethylstilbestrol

The general uses of this synthetic estrogen are well known. This discussion will be limited to the use of pellets of diethylstilbestrol for subcutaneous implanting in poultry. Pellets are usually 15 mg. size and it is very important that they contain a base which is uniformly and properly absorbed so that the drug can exert its action.

Veterinary Uses (Chickens). Originally the implanting of diethylstilbestrol pellets was used on old cocks with the result of a general "feminizing" reaction. The comb and wattles decrease in size and become light colored; crowing ceases, the bird becomes quiet. There is shown little tendency to fight. Subcutaneous, muscle and abdominal fat is materially increased, resulting in a better finish and improved flavor and tenderness for the meat. Some persons started using the term "chemical caponization" for this process; however, this is incorrect. It was soon discovered that the best application for such pellets was in the broiler industry. Properly treated broilers developed a superior finish and flavor after treatment. Several markets are now paying 3 to 5 cents per lb. premium for such broilers. In California, there are a few markets which are paying 8 cents per lb. premium for a special heavy broiler (Cornish - New Hampshire) treated with diethylstilbestrol pellets.

Turkeys. Diethylstilbestrol pellets have been used extensively on both turkey toms and hens for the past two seasons. The treatment on toms greatly reduces or stops fighting, promotes early feathering, produces market finish earlier, reduces pin-feather problems, reduces or eliminates the "pouch", results in superior finish (some treated toms have been graded tentatively as 93A and 94A by one large processor). The skin has an excellent color and texture and the carcass has a fine plump appearance. Turkey hens have an improved finish when treated in this manner.

Dosage. Chickens; approximately three to five weeks before marketing, make a ¼ in. incision through the skin high on the neck, and with thumb forceps implant one 15 mg. pellet under the skin at least 1 in. down from the opening. Various type pellet injectors are also available and more convenient to use. For large, older broilers and old cocks, use two 15 mg. pellets. Turkeys; Ingmand[23] recommends administering two 15 mg. pellets, as directed above, at 17 to 19 weeks of age or a time three to six weeks before marketing.

Note. Andrews, *et al.*,[22] report that 12 to 24 mg. diethylstilbestrol implanted in wether lambs gave weight gains of 0.50 lb. per day on treated animals while untreated controls had only a 0.35 lb. per day gain. The work of Jorden[26] shows that subcutaneous implanting of 12 mg. stilbestrol pellets in four-month-old lambs results in better weight gains than controls (0.43 lb. per lamb per day as compared to 0.35 lb.) but does not affect the grade of carcass. Another study by Dinusson, *et. al.*,[25] reveals that the subcutaneous implanting of 42 mg. stilbestrol in Hereford heifers weighing approximately 500 lb. produced better weight gains, growth rate, and feed efficiency when compared with untreated controls, spayed animals, animals receiving testosterone propionate injections and those receiving thiouracil.

Testosterone Propionate

Testosterone propionate is superior to testosterone because of its prolonged action. Its principal use is in the management of any disorder resulting from true hypoandrogenism due to hypogonadism. The production of androgen in the testes ceases when the Leydig cell system in the testes fails due either to pituitary failure or disease.

Veterinary Uses. Young males; to aid in general growth (nitrogen retention) in the development of primary secondary sex characteristics, descent of testes and completion of puberty. To aid in spermatogenesis (in conjunction with pituitary gonadotropic) and to improve semen quality. To counteract the effects

of sexual infantilism resulting in feminity attractive to other males.

Mature males; to restore sex drive and breeding potency, to improve the quality of seminal plasma (fructose content) and thus help increase longevity of spermatozoa. To counteract the effects of castration and restore vigor and muscular strength in aging males. To improve the growth of the hair coat, alleviate alopecia and certain eczematic skin disorders coincident to hypogonadism or castration, and aid in treatment of inflammations of the lower urinary tract and the penis. Mature females; to suppress lactation and to reduce mammae. To aid in treatment of pyometra when due to cystic ovaries or associated with pseudopregnancy. To prevert or abort early estrus in racing bitches and racing mares.

Dosage. Administer intramuscularly. Small animals—5 to 25 mg. Large animals—25 to 75 mg., depending on size of animal and seriousness of condition. Administer two or three times per week to effect.

SULFONAMIDES

The use of sulfanilamide, sulfathiazole, sulfapyridine, sulfadiazine, sulfaguanidine and sulfathalidine is generally well known. Therefore, only the newer types will be considered here.

Sulfamerazine

Sulfamerazine has a broader therapeutic range than the sulfonamides mentioned in the previous paragraph in that this agent is effective against a greater variety of bacteria. It produces fewer side reactions and is less toxic. Sulfamerazine is more rapidly absorbed, with resulting higher and more easily attained blood levels. It is excreted less rapidly in normal renal function, hence it maintains blood levels longer. One-half to one-third smaller doses can frequently be used for the same therapeutic effect, as compared to other sulfonamides, and the interval between doses can be increased since it persists in the blood stream. Sulfamerazine can be used for any condition for which most other sulfonamides have been used.

Veterinary Uses and Dosage (Selected). Cattle pneumonia: Use 1 to 2 gr. per lb. body weight per day, divided into two doses on first day; 0.5 to 1 gr. per lb. for second to fourth days, and 0.5 to 0.75 gr. per lb. for the third to fifth days. Good results.

Shipping fever: 20 to 30 gm. (310 to 465 gr.) administered in one dose. Repeat, if necessary, in 12 to 24 hours. Good results reported. May supplement with 500 cc. of a solution containing 2.5% each of sodium sulfathiazole and sodium sulfapyridine.

Foot-rot in cattle: 40 to 60 gm. sodium sulfamerazine in 500 cc. water intravenously for a 800 to 1,600 lb. cow. Animals usually improve in 24 to 48 hours with complete recovery in three to five days. Severe cases may need repeat treatment in two or three days.

Calf pneumonia: 1 gr. per lb. body weight per day, administered in one dose or divided in two. On second and third days, reduce dose 50%.

Retained placenta and endometritis: 0.5 gr. per lb. body weight per day in one dose first day, then reduce dose about ⅓. May also place 20 gm. in uterine cavity.

Septicemia in acute mastitis: 40 to 60 gm. in one dose on first day; reduce ⅓ to ½ on following days. Supplement with intramammary infusions of sulfanilamide in oil, tyrothricin or penicillin.

Sulfamethazine

This sulfonamide possesses the same general properties and has about the same general dosage schedule as described for sulfamerazine.

Sulfaquinoxaline

This is the newest of the commercially available sulfonamides. At this time it is being used principally in the prevention and control of cecal and intestinal coccidiosis in chickens and turkeys, and in the control of immediate mortality in acute fowl cholera of chickens, turkeys and pheasants. Sulfaquinoxaline is recognized as one of the most effective drugs available for the treatment of coccidiosis. Kendall[**] found that sulfaquinoxaline in drinking water was far more effective in limiting mortality from cecal coccidiosis in young chicks as compared to sulfamethazine. It is somewhat more toxic than the other sulfonamides in general use and more attention is necessary to be certain that proper dosage schedules are maintained. Sulfaquinoxaline is available as a powder for mixing in feed, a soluble powder for preparing solutions to be used in feed or drinking water, a solution for use in drinking water and a tablet for drinking water purposes. Considerable care must be exercised to be certain that any form of sulfaquinoxaline has been thoroughly mixed in the feed or water.

Dosage schedules are too detailed for use in this paper, but complete directions will be found on the label or accompanying literature for these products[**].

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Other uses have been suggested for sulfaquinoxaline. Frank[34] reports the use of 1 teaspoonful of sulfaquinoxaline in 1 qt. of water injected slowly into the rectum and retained as long as possible in treatment of coccidiosis in older beef cattle. Preliminary studies of Eveleth, *et al.*,[35] suggest the use of 0.5 gr. sulfaquinoxaline per lb. body weight, twice daily for one or two days, then reduce 50% for one or two days in the treatment of pasteurellosis of swine. These investigators also indicate that repeated doses of 0.5 gr. per lb. body weight, twice daily, to chickens, lambs, cattle and swine have not produced toxic symptoms when given for three and four successive days. Several practitioners have been using sulfaquinoxaline experimentally in the treatment of swine enteritis. One method recommended is to use 1 pt. of a 3.44% sodium sulfaquinoxaline solution in 50 gal. drinking water; another is to use 1 pt. of such solution in 1 gal. of water to prepare a stock solution, then 1 pt. of the stock solution in 16 gal. of drinking water for three or four days, with the concentration being reduced to 1 pt. in 32 gal. if medication is continued more than four days. On the other hand, a few have used a greater concentration by using 1 fluidounce of the 3.44% solution for each gallon drinking water for three days. Other practitioners have used from 3 to 16 oz. of the 3.44% solution to 1 gal. water and administered as a drench in treatment of calf scours. It should be emphasized that these uses and dosage schedules for other than poultry are experimental and must be used with caution until such time as more specific outlines can be established under controlling conditions. No doubt, sulfaquinoxaline will be found to have other uses as more experimental and clinical work is completed.

Note. The majority of sulfaquinoxaline solutions now marketed contain 3.44% sodium sulfaquinoxaline. Each fluidounce of such solution contains 0.946 gm. or 14.6 gr. sulfaquinoxaline or 1 cc. contains approximately 0.5 gr.

Thalamyd (Phthalysulfacetamide)

The use of this drug in successful treatment of diarrheas in dogs has been suggested by Rogoff[37]. The drug is not absorbed from the gastrointestinal tract so is relatively non-toxic. The dosage is 2 or 3 gr. per lb. body weight per day, in divided doses, for dogs up to 10 lb.; 1 to 2 gr. per lb. for 10 to 30 lb.; and 1 gr. per lb. for over 30 lb. weight. Treatment should be continued for at least three days.

VITAMINS

B Vitamins

Lueke, *et al.*,[38] report a detailed study of 80 cases of nutritional enteritis in pigs characterized by a severe enteritis which involved the cecum and colon. Evidence indicated that deficiencies of niacin, pantothenic acid and possibly riboflavin were involved in producing symptoms, and intraperitoneal injections of a solution of thiamine, riboflavin, niacin, pantothenic acid and pyridoxine, followed by supplementation of the feed with the same B vitamins, proved to be effective in curing 86% of the pigs suffering from this form of enteritis. A solution containing 10 mg. thiamine hydrochloride, 2 mg. riboflavin, 50 mg. calcium pantothenate, 100 mg. nicotinamide and 2 mg. pyridoxine per cc. in doses of 3 to 5 cc. intraperitoneally, subcutaneously or intramuscularly is the usual initial dose.

Vitamin B_{12}

This newest member of the B vitamin family has been used largely in human medicine; however, some investigators believe it will have application in the treatment of small animals, chickens, turkeys, swine, fur-bearing animals and possibly other animals. Symptoms of B_{12} deficiency in the pig are characterized by dullness, hyperirritability, incoordination and pain in the hind quarters, as well as voice failure. The blood picture shows normocytic anemia, slight leukopenia, and high erythroid count in the bone marrow. In man, it exerts a high hematopoietic activity in certain macrocytic anemias and is used in pernicious anemia, nutritional macrocytic anemia, certain cases of macrocytic anemia of infancy, and sprue. The human dosage is approximately 1 microgram per day, minimum maintenance, or 15 to 30 micrograms once or twice per week, intramuscularly. Bird[39] states that a good starting diet for chickens must contain enough animal protein supplement or other source of B_{12} to supply 7 to 10 micrograms per lb. of feed. The quantity needed in a breeder diet is probably only one-fourth to one-half as much. Growing swine should have 15 to 22 mg. B_{12} per ton of feed, or 0.75 to 1.1 mg. per 100 lb. Less is required in older animals where growth is not as rapid.

Animal Protein Factor (APF)

The animal protein factor, so-called because it was first observed in association with animal protein products, is a complex of two or more closely related vitamins, one of which is vita-

min B_{12}. This factor is essential for maximum growth, reproduction and normal hemopoiesis. Chickens, turkeys, and pigs, and possibly other animals, require the animal protein factor. Ruminants are apparently able to synthesize these factors. Chicks and turkey poults require these factors for survival and early, vigorous growth. Hens require these for production of hatchable eggs and vigorous chicks. Pigs must have a dietary source of these factors for maximuum growth, efficient utilization of feed and normal hemopoiesis. Some practitioners have been using the APF type products in 0.5 to 2% concentration in feed for treatment of swine enteritis and report satisfactory results; however, more experimental work must be done on this problem. Animal protein factor concentrates are now available for use in enriching feeds.These contain various amounts of vitamin B_{12} and usually also contain one or more antibiotics. New regulations require the label on such concentrates to state both the B_{12} and antibiotic content.

MISCELLANEOUS

2-Amino-5-Nitrothiazole

Waletzky, *et al.*,[40] and others, report good results in the use of this drug as a control measure during natural outbreaks of enterohepatitis in turkeys, and as a preventive measure before outbreaks occur. For control, a mash containing 0.1% of the drug is fed for two weeks, after which the concentration is reduced to 0.05%. For prevention, a mash containing 0.05% of the drug is fed continuously.

Cortisone

In June 1950, Shaw and Hatziolos[41] described initial studies in which cortisone had produced good response in the treatment of ketosis. This presents a new concept and suggests the possibility that abnormal function of the adrenals and pituitary may be involved in ketosis. At present the cost of cortisone is too high to be economically feasible in most cases. (See Puntriano, Guillermo, Hormonal Hypothesis of Prepartum and Postpartum Acetonemia in Dairy Cattle. *Vet. Med.*, 46:215 [June], 1951.)

Curare

Curare has been used in veterinary medicine as palliative treatment for spastic paralysis and relief of muscular spasm in tetanus in dogs. Jones[42] suggests its use in other convulsions and as a skeletal muscle relaxant in reduction of bone fractures. The dog tolerates about 1 unit per kg. of body weight; the lamb and calf tolerate only 0.5 unit per kg.; and the pig has even less tolerance. Curare could be used as a skeletal muscle relaxant in anesthesia in large animals, but such use is complicated by not having any suitable method for artificial respiration during a 15-20 minute period when this might be essential. (Note: *d*-Tubocurarine hydrochloride is used for the same purpose as curare and is probably superior.)

Desoxycorticosterone

The use of two doses of 25 mg. desoxycorticosterone is not 100% effective, but is very helpful in treating ketosis and restoring normal carbohydrate metabolism according to Vandelplassche[43].

Hyaluronidase

This enzyme breaks down hyaluronic acid which forms a portion of the material in the interstices of tissue. When the hyaluronic acid is no longer a barrier in the tissue, injected fluids are rapidly absorbed and no pressure develops. This enzyme aids in rapid distribution of medicinal agents injected either subcutaneously or intramuscularly and will be useful in conjunction with many veterinary parenteral products. Preparations containing hyaluronidase are now available for use in human medicine. Eveleth[44] has published a preliminary report on its use in veterinary medicine.

Nitrofurazone and Nitrophenide

Nitrofurazone in 0.02% or more concentration in mash is satisfactory for prophylaxis of certain types of coccidiosis (*Eimeria necatrix*) in chickens, while nitrophenide concentration must be 0.05% to be effective and this approaches the limit of tolerance according to Peterson and Hymas[45].

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The Nature of Reproductive Failures

The nature of reproductive failures may follow the pattern shown by the study of a group of 104 dairy cows. Dr. T. Y. Tanaba, Gosney Research Fellow, California Institute of Technology, divided this group into three main categories during the first 34 days after breeding: (1) failure of fertilization, 39.7%; (2) embryonic abnormalities and mortality before 34 days, 39.2%; and (3) embryo still normal at 34 days, 21.1%.

Further details of this work were presented at the annual meeting of the California State Veterinary Medical Association. In 10% of a group of cows, referred to in the preceding paragraph, visible genital abnormalities were found at slaughter which were not detectable by clinical examination. Tubal abnormalities accounted for nearly 8% of these.

The percentage of genitally normal cows having fertilized ova when slaughtered three days after breeding, was 66.1. Thirty-four days after breeding, only 23.1% had normal embryos; indicating an embryonic death rate of 65.1%. Recurrence of estrus accounted for 50% of the cows scheduled for the 34th-day slaughter. Of these, 15.4% had abnormal embryos and 11.5% had no embryos and yet had not returned to estrus.

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None of the laboratory animals ordinarily used are susceptible to paratuberculosis. This fact makes difficult experimental studies of Johne's disease in cattle. — *A. H. Groth, D.V.M.*

Hormonal Hypothesis Of Prepartum And Postpartum Acetonemia In Dairy Cattle

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PART II*

Prepartum Acetonemia

STATISTICAL reports from the study of acetonemia in dairy cows show that it is rare in its incidence during pregnancy.

These are in agreement with our hormonal viewpoint which explains the infrequency of ketosis due to the uncommon development of hypoglycemia during pregnancy, as a result of the following physiological influences:

(a) Hypertrophy of the adrenal cortices, which increases their output of cortical steroids, as a result of pregnancy[15].

(b) Increased level of physiologically active estrogens during the latter stages of gestation. The total amount of conjugated estrogens falls shortly after parturition, whereas the amount of unconjugated, physiologically active estrogens, undergoes a relative increase at this time[16]. This may result in an increased corticomimetic effect which would secure the demands of the body as far as carbohydrates are concerned.

(c) The biologically similar effects of progesterone of the corpus luteum and corticosterone of the adrenal cortex. It has been shown that progesterone can replace corticosterone to a large extent and can support life after adrenalectomy[17]. Progesterone is related chemically to the steroid hormones of the adrenal cortex. That is why it is not surprising that progesterone is capable of relieving the symptoms of adrenocortical insufficiency[18].

(d) The inhibition of lactation through the anteropituitary by estrogens[19] and probably by progesterone[20] during pregnancy, saves the body from another stress condition and thus, the development of acetonemia would be less probable.

From the former considerations, it seems that a cow suffering from ovarian dysfunction (hypo-ovarian follicular secretion, for instance) with a consequent decreased stimulus of the corticomimetic mechanism of estrogens, may not show manifestation of hypoglycemia at gestation periods. The increased output of cortical steroids caused by the alarm reaction mechanism during pregnancy, and the increased titers of estrogens and progesterone obtained with the aid of placental tissue, would overcome an ovarian follicular insufficiency. It is after parturition, when the period of lactation starts, that the effects of abnormal titers of estrogens would be manifested and acetonemia might develop.

Extensive damage of the adrenal cortices, marked functional disturbance of the anteropituitary, or intense additional stress conditions would be causes of ketosis during pregnancy.

Postpartum Acetonemia

The high percentage of ketosis in dairy cattle occurs at postpartum.

According to our hormonal hypothesis, the driving forces, which could develop acetonemia after parturition in cows, would depend upon the functional state of the ovaries and adrenal cortices when the period of lactation starts. The anteropituitary would be involved as a consequence of the derangement of the former endocrine glands (ovaries and adrenals) although the anterior pituitary gland *per se* could be the primary seat for the hormonal imbalance. Let us proceed to analyze each of these driving forces.

1. Ovarian Dysfunction

Before considering the pertinent part of this discussion, it would be of interest to point out the writer's reasons for thinking the female hormones (estrogen and prolactin) play a prevalent part in the development of ketosis.

(a) Acetonemia is a metabolic disturbance which occurs mainly in cows. Evidence has not been presented to show that significant acetonemia occurs in bulls.

(b) Ketosis is most prevalent at postpartum and in high milk producing cows.

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(c) Reports from clinical cases of nymphomania in cows, as well as cases of ovarian tumors (increased output of estrogens), shows practically negative incidence of acetonemia.

(d) The corticomimetic effects of estrogens and their possible influence on the secretion of prolactin by the anteropituitary.

Ovarian dysfunctions refer to conditions in which the normal hormonal output from the ovaries is altered. Thus, when the secretion of estrogens from the ovaries is above the normal rate, the condition is called hyperovarian follicular secretion. When the secretion of estrogens is below the normal rate, the condition is named hypo-ovarian follicular secretion.

In the following paragraphs will be discussed the possible influence of low titers of estrogens originating from a hypo-ovarian follicular secretion, during pregnancy and lactation periods.

Normally, the level of estrogens after gestation suffers a considerable decrease as compared to when parturition approaches[19]. This accounts for the release of prolactin which is supposed to be inhibited by the high level of estrogens prevailing during pregnancy[19]. We should be able to distinguish during lactation periods, therefore, between inhibitory and lactogenic threshold of estrogens among animals of the same species. The latter could be known as physiological threshold. Furthermore, we should not consider the physiological threshold of estrogens prevailing during lactation periods as a non-varying amount of estrogens for the same species. It varies within certain defined limits as lactation proceeds or other physiological factors exert influence[21]. That is why it would be more appropriate to refer to a physiological threshold ratio. Thus, the ability of certain dairy cows to continue lactating even though a new pregnancy comes, is perhaps an example in which a greater tolerance for estrogens exists due to the raising of the inhibitory threshold under special circumstances.

In accordance with a previous discussion, when the titers of estrogens are low (as a result of a hypo-ovarian follicular secretion, for instance) during pregnancy, its corticomimetic effects on the systemic hormonal interplay would not be appreciably decreased, since a supplementary amount of estrogens are provided from placental tissues. But after parturition, if the level of estrogens appears below the physiological threshold ratio prevailing during lactation, the corticomimetic mechanism, as well as the output of prolactin, would be upset. As a result of these disturbances, ketosis would appear. This may happen as follows:

(a) If the physiologically active estrogens do not stimulate sufficiently the anteropituitary to release increased amounts of ACTH, and this latter hormone does not stimulate the adrenal cortex to produce its hormones in amounts needed for lactation purposes (primary cortical insufficiency), a lowering of blood sugar will result.

(b) If the estrogens are in amounts below the physiological threshold ratio indicated for lactation, they would permit an increased output of prolactin, since the inhibitory or lactogenic effects of estrogens upon the anterior pituitary gland go parallel to its quantities. As a result of this, an increased lactation (which would cause a secondary cortical insufficiency) may result. (The findings of Staffe,[22] which show that the milk yield of ovariectomized cows exceeded that of controls, and the report of Copeland[23] from statistical examinations of a large number of bovine milk records which indicates that a slight decrease in milk yield occurs during estrus, are suggestive instances of the influence of quantities of estrogens on lactation in cows).

Obviously, an increase in milk secretion (additional stress condition) in a cow which suffers a lowering in blood sugar, would result in significant hypoglycemia. This latter condition would develop ketosis. (The usual thinking of certain farmers that a high milk producing cow is frequently acetonemic or infertile, could perhaps have its basis on an abnormal level of estrogens associated with a hypo-ovarian follicular secretion).

The picture of the etiology of the above type of acetonemia could be represented by an average or high milk producing cow, with normal adrenal cortices and anterior pituitary gland, but suffering from a hypo-ovarian follicular secretion. When the lactation starts, the alarm reaction mechanism would function normally, but the corticomimetic mechanism would fail to supply the adequate adjustments assigned to it in overcoming the requirements for lactation.

Hyperovarian follicular section would produce opposite effects. Levels of estrogen above the normal threshold prevailing during lactation, would diminish or suppress the milk secretion, and also would increase the output of ACTH of the anteropituitary through the corticomimetic mechanism. The adrenal cortices will increase the secretion of their hormones to larger amounts than normal resulting finally in an increase in blood sugar. All these conditions would make improbable the development of ketosis. In fact, clinical re-

ports from cases of nymphomania in cows, as well as cases of ovarian tumors, show practically negative incidence of acetonemia. The theories about the etiology of nymphomania in cows will be discussed later.

2. Exhaustion of the Adrenal Cortex

Exhaustion of the adrenal cortex refers to its inability to respond adequately to normal stimulus due to previous excessive demands upon the gland. In other words, when stress conditions injure the adrenal cortex, this gland would not respond sufficiently to further stresses (failure to respond normally to the alarm reaction and corticomimetic effect of estrogens). An insufficiency in the output of cortical steroid hormones would be the principal manifestation during exhaustion of the adrenal cortex.

When the exhaustion develops during pregnancy due to additional stress condition, which has been already cited, the effects would be manifested after parturition when a new stress condition, such as lactation, appears (primary cortical insufficiency). Due to the incapacity of the adrenal cortex to supply adequately the demands of a normal lactation, hypoglycemia and ketosis may develop.

It should be observed that diseases such as pneumonia, hemorrhagic septicemia, gastritis, kidney troubles, etc., occurring during pregnancy, would frequently cause exhaustion of the adrenal cortex. By the same token, an abnormally large fetus, disease of the fetus, dystocia, extreme cold weather, etc., may also cause exhaustion. In respect to the latter stress condition, it should be noted that acetonemia is most prevalent during the winter. Of course, the nutritional factor is another that could account for the frequency of ketosis during that time. Finally, a low level of ascorbic acid (vitamin C) in the blood could be considered to be important in a rapid adrenocortical exhaustion since that vitamin is one of the factors in building up of cortical steroid hormones.

3. Abnormal Function of the Anteropituitary

It has been said that the pituitary is the master-gland of the body since many members of the endocrine system are governed by it. Conversely, the normal function of the pituitary depends upon normal hormonal balance of the rest of the endocrine glands. This latter condition, in turn, could rely mainly upon the anatomical structure and the physiological potentialities of each of these interplaying endocrine glands which are genetically determined individually.

From the above considerations, it appears that a pathological condition of the ovaries or adrenal cortices would upset the normal function of the anteropituitary; or this latter gland *per se* could be the primary seat of the disturbance.

Hypo-ovarian follicular secretion is a condition which could be originated from an insufficient output of FSH from the anteropituitary. The primary seat of this dysfunction could be the basophil cells of the latter gland, whose function is believed to be the production of FSH[24]. An acetonemic condition developed from a hypo-ovarian follicular secretion, could have, therefore, its origin in abnormal function of the anteropituitary.

Cystic ovaries is the condition which also is believed to have its primary seat on an abnormal function of the anterior pituitary gland. Two theories have been presented to explain the development of cystic ovaries. One belief is that such a condition occurs as a consequence of decreased output of LH by this gland in the presence of normal amounts of FSH. Another theory is that by the persistence of corpora lutea secreting some levels of progesterone during non-pregnancy period, it would cause inhibitory effects in the release of LH. This would cause failure of ovulation and then the ovaries would become cystic. An excessive output of estrogens would be caused by cystic ovaries, which would be manifested in a cow by nymphomaniac symptoms. As has been discussed before, this condition could show practically negative incidence of acetonemia.

Finally, the anteropituitary could be considered also an indirect factor in the development of acetonemia when its hormonal production is upset. Thus, the writer would postulate the hypothesis that an increased output of prolactin (excessive lactation) would cause a decreased output of ACTH. This may occur by considering the report which supports the thinking that both prolactin and ACTH are hormones elaborated by the same type of cells, namely acidophils[25] of the anteropituitary. A stimulus tending to increase the production of prolactin would cause a shift in the synthesizing properties of the acidophil cells and thus decrease their elaboration of ACTH; and *vice versa*, a stimulus tending to increase the production of ACTH would cause a decrease in the synthesis of prolactin.

This hypothesis would offer a possible explanation to cases of acetonemia in dairy cows as a result of excessive demands of prolactin

from a great functional development of the mammary gland. An intense stimulus from suckling or milking could increase also the demands of prolactin from the anteropituitary which, in turn, would decrease the synthesis of ACTH. A decreased output of this latter hormone would cause a primary cortical insufficiency which would cause ketosis.

4. Genetic Factors

The great functional development of the mammary gland in cows genetically selected for milk production could be considered as a predisposing factor in causing ketosis. Excessive demands for milk secretion could produce acetonemia by two different mechanisms, or by the combination of them.

One direct cause would be by subtracting carbohydrates in increased amounts from the blood to meet the excessive demands of milk precursors, (secondary cortical insufficiency). The other would be indirectly by decreasing the synthesis of ACTH as a result of increased demands of prolactin, according to the previous hypothesis (primary cortical insufficiency).

Genetic factors could be considered also predisposing to the development of acetonemia when a cow inherits abnormal physiological potentials, either in one or many of its endocrine glands. Thus, an animal which inherits an adrenal cortex function insufficient to attend an abundant lactation, should be considered as being predisposed to suffer from acetonemia.

(*To be continued*)

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Feline Anatomy*

In cats, the skin in the vicinity of the jaws and adjacent portion of the neck is very thick; occasionally, one-half inch.

There is no evidence that the short face of cats produces dental distortion as occurs in short-faced dogs.

No lateral motion is possible in the lower jaw, it being a pure hinge joint, and therefore the premolars are not grinders. It is intended that the animal shall swallow its food in chunks.

The frontal sinus is quite large and appears to communicate directly with the nasal cavity. The palatine sinus, invading the posterior part of the palatine bone and adjacent part of the sphenoid bone, is very large.

The maxillary sinus, if present, is very rudimentary.

The roots of the fourth molar in cats do not diverge as in dogs, and if necessary this tooth may be removed easily for the purpose of draining the sinus through the alveolus.

In cats, the radius and ulna can be so extensively rotated upon each other that it is a simple matter to turn the palms so that they exactly face each other.

Cat and rabbit carcasses may be distinguished from each other by the well developed muscles of the shoulder arm and forearm of the cat in contrast to the meager development in these regions of the rabbit.

The soft palate is as long as the hard palate.

It is the opinion of anatomists at Kansas State College that cats purr by vibrating the free edge of the soft palate; purring is not a laryngeal sound.

The tongue, especially on its dorsum, has many horny papillae, directed backwards. There are similar ridges of papillae in other parts of the mouth, particularly on the mucosa of the hard palate.

The cat has numerous salivary glands, including an infraorbital one; it opens in the mouth behind the last molar.

The cat has large anal sacs meeting each other on the ventral surface of the rectum, then diverging outwardly, upwardly and in a backward direction, opening on the skin of the anus a little below the dividing line between the upper and lower half of the anus.

The urinary bladder is entirely abdominal, all parts being covered with peritoneum excepting most of the pelvic portion of the neck of the bladder, which has no peritoneum.

Because of the position and direction of the inguinal canals, scrotal hernia seems physically impossible.

The Kansas State College anatomist has never been able to demonstrate an os penis in any of his dissection subjects.

The glans penis has a smaller circumference than the body of the penis, is cone-shaped, and is covered with horny papillae directed upward.

There is a pedunculated body just back of the cervix and attached to the wall of the vagina. Its function is unknown.

In the cat, as distinguished from the dog, the medial saphenous vein is the larger, and is preferred over the lateral saphenous vein for intravenous injections.

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Most surgeons now agree that antiseptics have no place in the treatment of surgical wounds.—*W. W. Armistead, D.V.M.*

*Notes from a seminar at the School of Veterinary Medicine, Kansas State College, Manhattan.

Toxaphene Residues In Fat Of Sprayed Cattle*†

R. D. RADELEFF,** D.V.M., H. V. CLABORN,†† B.S., H. F. BECKMAN,†† B.A., R. W. WELLS,††B.A.,M.S., and R. C. BUSHLAND,†† B.S.,M.S.

IN comparative laboratory and field tests conducted by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture, it was reported[1] that toxaphene was highly effective against various species of ticks affecting livestock and that it was almost as effective as DDT for control of horn flies on cattle. The entomological investigations indicated that toxaphene sprays applied to cattle for tick and fly control would require a concentration of 0.5% of the insecticide. Under conditions most favorable for the pests, sprays might have to be applied as frequently as at two-week intervals, but research experience indicated that four-week intervals of treatment would suffice under most conditions. In the southern United States it might be necessary to apply sprays over a season as long as six months.

Before recommending toxaphene sprays for control of ticks affecting cattle, it was necessary to establish whether applications of the chemical at 0.5% concentration at intervals of two and four weeks over a six months' season would cause an accumulation of the insecticide in the fat of test animals. Tests were conducted at the Kerrville, Tex., laboratory of the Bureau of Entomology and Plant Quarantine.

Test Animals

For this study, 36 high-grade Hereford steers were purchased from ranchers, in the vicinity of Kerrville, who could furnish satisfactory assurance that the animals had not previously been treated with any of the chlorinated hydrocarbon insecticides. The steers at time of purchase ranged in age from seven to nine months, weighed an average of 459 pounds, and were in good range condition. The test animals were confined in a feed lot and placed on a diet consisting of mill-mixed sweet feed, cottonseed meal, corn, and oats; with alfalfa, Sudan grass, cane, and hegari hays. To eliminate the possibility of insecticide-contaminated feed, a sample of each purchase was analyzed and found negative for organic chlorides. The amounts fed were increased gradually during the experiment to maintain growth and moderately fatten the animals, but top feeding was not practiced.

Analytical Method

As there is no specific chemical test for toxaphene, insecticide contamination was evaluated on the basis of increase in organic chlorides content of the fat sample, since it has been shown that chlorinated hydrocarbon insecticides absorbed and stored by animals are concentrated in fatty tissues. In this study, insecticide contamination was evaluated by analysis of omental fat taken by omentectomy, using a technic developed by Radeleff[2]. Approximately 50 gm. of omental fat were removed at each operation. Only one animal died as the result of surgery and the operations caused insignificant weight losses. The method used for the determination of organic chlorides was essentially that described by Carter[3] for the estimation of DDT in milk, modified as follows:

Blend 25 gm. of fat with 125 ml. of distilled, reagent grade benzene in a Waring blendor for two minutes. Add 20 gm. of anhydrous sodium sulfate and blend an additional minute. Add 1 gm. of filtercel; mix and transfer to a 400-ml. beaker. Rinse the residual material from the blendor into the beaker, using small amounts of benzene. Allow to settle for a few minutes, then filter through quantitative filter paper into a 500-ml. Ehrlenmeyer flask, using several small volumes of benzene to wash the beaker and insoluble material. Distill off the benzene to a volume of about 30 ml., add 50 ml. of benzene and 100 ml. of isopropanol (99%) followed by 10 gm. of sodium metal cut into small pieces. Reflux for two hours, let cool for a few minutes, then add 25 ml. of a 1:1 water-isopropanol mixture cautiously through the condenser.

*Report of a study made under the Research and Marketing Act of 1946.

†This experiment was conducted under a cooperative agreement between the Bureau of Entomology and Plant Quarantine, Bureau of Animal Industry, Texas A. & M. College, and the Hercules Powder Company and was partly financed by that company.

**Bureau of Animal Industry; ††Bureau of Entomology and Plant Quarantine, Agricultural Research Administration, USDA, Washington, D.C.

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When the excess sodium has reacted, add 25 ml. of distilled water and 3 ml. of hydrogen peroxide (30%). Reflux for 30 minutes, then determine the organic chlorides as described by Carter[3].

A Fisher potentiometric titrimeter was used for the titration of chlorides. The standard solution of silver nitrate was 0.01 normal. Analyses were run in groups of eight and a blank on reagents was run with each group.

With the use of 25-gm. samples, the analytical method was accurate to ± 2.8 p.p.m. organic chlorides. Analyses were routinely made on duplicate samples but sometimes the quantity of fat removed in an operation was adequate for only a single determination.

Procaine hydrochloride is insoluble in anhydrous benzene. When 1 ml. of a 2% aqueous solution was placed upon a 25-gm. sample of fat, allowed to dry, and the sample extracted with benzene dehydrated with anhydrous sodium sulfate, as described above, it did not increase the chloride content of the sample. Therefore, the use of the local anesthetic in surgery did not affect the accuracy of the chemical analyses.

Test Procedure

After the experimental animals became established on the new diet they were biopsied to procure fat for analysis. In addition to analyzing fat from each animal for organic chlorides, a number of samples were analyzed for DDT, using the method described by Schechter,[4] *et. al.*, as a check on former owners' statements that the animals had not previously been treated with chlorinated hydrocarbon insecticides. All samples were negative for DDT. The organic chloride content of the fat ranged from 0 to 13 p.p.m. and averaged 4.7 p.p.m. for the group of 36 animals.

The animals were divided into three main groups. One group consisted of six steers scheduled to be sprayed every two weeks with plain water and thus serve as controls. A second group was scheduled to be sprayed with 0.5% toxaphene at two-week intervals. Individual animals were operated upon after various numbers of sprayings as follows: Three steers each after one, two, three, four, and six sprayings; two steers each after eight and ten sprayings; and five after 12 sprayings. A third group consisted of steers scheduled to receive a total of six sprayings of 0.5% toxaphene applied at four-week intervals, representative animals being biopsied two weeks after each spraying.

Spray Treatment

The emulsion concentrate used for all applications consisted of 50% toxaphene, 35% kerosene, and 15% emulsifying agent (Atlas G-1045). For each treatment, the insecticide was freshly diluted with ordinary well water to yield a final concentration of 0.5% toxaphene.

The emulsion was applied to the steers as indicated, using a power sprayer maintaining a constant pump pressure of 280 p.s.i. The spray nozzle used was a fast-adjusting type permitting the spray pattern to be changed quickly to effect deepest penetration of the hair to wet all areas of the skin. Each animal was sprayed to saturation. The quantity dispensed by the machine per animal averaged 1.64 gal. for each application. Experiments on similar steers wherein the "run-off" was measured indicated that each animal retained approximately 1.4 qt. of spray at each treatment.

TABLE 1. Organic Chlorides, P.P.M., in Successive Biopsy Samples Taken at Approximately Monthly Intervals from Steers Sprayed Bi-weekly 12 Times With Water Only

Steer number	Biopsy First	Second	Third	Fourth	Fifth	Sixth
3	4*	1*	8*	5	5	1
4	3*	3*	6*	....	6	5
27	10	8*	7	6		

*Based on single analysis. Others based on duplicate analyses.

All spraying operations were carried out in an enclosed barn on a concrete floor. After spraying, the steers were held in the barn until dripping was completed. Then they were released to the feed lot. The six steers serving as controls were sprayed each two weeks with plain water.

Results

In general, the spray treatments and the biopsy procedure had little effect on the test animals. Three of the six control steers sprayed at bi-weekly intervals with water only and not operated upon during the course of the experiment gained an average of 380 lb. during the 26 weeks. The other three control steers, one subjected to four, another to five, and the third to six operations, gained an average of 365 lb. Steers sprayed 12 times at bi-weekly intervals with toxaphene gained 362 lb.

The two steers, 30 and 35, slaughtered two weeks after the twelfth bi-weekly application, were subjected to detailed autopsy study as

well as studies of histology to determine micropathological changes. Steer 30 revealed a mild diffuse peritonitis as a result of the previous week's surgery, while steer 35 showed no gross disturbance.

Histological studies of the liver, kidney, cerebrum, cerebellum, heart, and spinal cord revealed no lesions.

The results of organic chloride determinations on fat from the three control steers biopsied at four-week intervals are shown in table 1. The organic chloride determinations varied as much as 7 p.p.m. in the case of an individual animal, a variation 2½ times as great as the possible analytical error. It appears, therefore, that there is considerable variation in the normal organic chloride content of omental fat.

TABLE 2. Results of Analyses of Fat Samples from Steers Sprayed Bi-weekly with 0.5% Toxaphene. The Organic Chlorides Reported are an Average of Duplicate Analyses Unless Noted

Steer number	Number of sprayings	Organic chlorides, p.p.m. Before treatment	In indicated number of weeks after final spraying 2	6	10	14	18
7		6	6				
24	1	7	6*				
29		6	10*				
13		1	9	12*	4*	8*	1
19	2	3*	12	8*		7	<1
20		1	13	9*	5	7	4
14		0	13*	9	6	<1	
16	3	2	8*	7	5	2	
18		2	11*	9	8	4	
21		6	14	10	8		
22	4	8	16	5	7		
23		7	11*	10	5		
9		<1	7	0			
10	6	2	9	3			
11		0	6	2			
25	8	8	8	3			
28		9	8	1			
31	10	9	4				
33		7	8*				
26		9	<1-**				
30		7	2-**(after slaughter ***body fat 3, omental 6.)				
34	12	8	1-**				
35		4	<1-**(after slaughter ***body fat 2, omental 4.)				
36		9	2-**				

*Figure based on a single analysis.
-**Biopsy performed one week after final spraying.
***Steers slaughtered two weeks after final spraying.

Steers Sprayed at Two-week Intervals

The organic chloride determinations on fat from animals sprayed at two-week intervals are assembled in table 2.

In animals sprayed one time there was no significant increase in organic chlorides in fat taken two weeks after treatment.

In the animals sprayed two, three, four, and six times at two-week intervals, the organic chloride content of the fat taken two weeks after the last spraying was considerably greater than the organic chlorides present in fat taken before spray treatments began. In the animals sprayed twice, it was 18 weeks before biopsy samples produced fat of the same low organic chloride level as was found before treatment. In the animals sprayed three times, the interval between last spraying and return to original value was 14 weeks. In those sprayed four times it was ten weeks, while in those sprayed six times it was only six weeks. As the results in table 1 indicated that normal variation of organic chlorides might be expected to be as great as 7 p.p.m., the significance of the results indicating the duration of contamination is open to question.

Animals sprayed eight, ten, and 12 times showed no increase in organic chlorides two weeks after the last spraying. Two of the steers sprayed 12 times had omental fat removed by biopsy and then were slaughtered. Results of analyses on body fat and omental fat taken after slaughter agreed within the limits of analytical error and the values also coincided with those obtained on samples taken by biopsy.

There was a question as to whether biopsy samples taken two weeks after spraying represented maximum contamination of fat. Earlier work on acute toxicity of toxaphene sprays reported by Radeleff[6] and Radeleff and Bushland[8] suggested that maximum absorption of insecticide occurred within 48 hours of treatment.

To check on the extent of fat contamination two days after spraying, three steers were biopsied; two days later they were sprayed with 0.5% toxaphene, and two days after spraying omental fat was again removed. Samples were analyzed with the following results:

Steer number	Organic chlorides, p.p.m. 2 days before spraying	2 days after spraying	Net change
3709	3	9	+6
3699	10	7	—3
3895	9	10*	+1

*Figure based on a single analysis. Others based on duplicate analyses.

It appeared that any fat contamination which resulted was not sufficiently great to be detected by the analytical method.

Steers Sprayed at Four-week Intervals

Seven steers were sprayed at four-week intervals and groups of four and three were alternately biopsied at two-week intervals after spraying. Following the third operation, one of the steers in the group of four died as a result of postoperative ventral hernia, producing the only fatality in the experiment.

The results of analyses on fat samples from those animals are shown in table 3.

TABLE 3. Results of Analyses of Fat Samples Taken Four Weeks After Spraying (Steers Sprayed Every Four Weeks with 0.5% Toxaphene)

Steer number	Organic chlorides, p.p.m. Before treatment	After indicated number of sprayings preceding biopsy 1	2	3	4	5	6
5	4*	5*	6	....	6	....	<1
6	4*	2*	11	....	7	....	2
12	<1	1*	11	....	9	....	4
17	2	7	10	....	10**	....	....
7	6	....	....	5	....	4	....
24	6	....	....	7	....	4	....
29	6	....	....	6	....	7	....

*Figure based on a single analysis. Others based on duplicate analyses.
**Steer 17 died after biopsy. Body fat analyzed 9 p.p.m. and omental fat 10 p.p.m. organic chlorides.

It appeared that one spraying caused no significant increase in organic chlorides. The animals biopsied after two and four sprayings yielded fat which showed an increase in organic chloride content but it happened that fat from these animals taken at control biopsy yielded very low values. It is questionable whether the increase in organic chlorides can be attributed to toxaphene contamination or whether the high values merely express a normal fluctuation in organic chlorides accumulated in the fat. The three animals biopsied after three and five sprayings yielded fat at control biopsy averaging 6 p.p.m. organic chlorides and the post-treatment samples did not exceed that value.

Conclusions

The results of this experiment indicated that young Hereford steers held on a moderately fattening diet could be sprayed repeatedly with 0.5% toxaphene without accumulating large amounts of toxaphene (as indicated by organic chlorides analysis) in their fat and without damage to internal cellular structure of the body.

Single applications of 0.5% sprays produced no detectable residue two days, two weeks, or four weeks following treatment.

Some increase in organic chlorides was noted following two to six applications at two-week intervals. These increases disappeared in from six to 18 weeks following suspension of treatment.

No significant increases of organic chlorides occurred in the fat of cattle sprayed eight, ten, or 12 times at bi-weekly intervals.

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Honors Conferred by American Animal Hospital Association

Two charter members of the A.A.H.A. were honored during sessions of this organization's annual meeting in Atlantic City, N. J. Dr. J. V. Lacroix, Evanston, Ill., was presented a scroll and service medal for outstanding contributions in the founding and organization of this association. Dr. Louis H. LaFond, Detroit, Mich., was similarly honored and presented with a scroll and medal. Doctor LaFond served the Association as president, 1939-40, and lately has traveled extensively as hospital inspector.

Attendance records were broken at the Atlantic City meeting with 536 registered for the sessions.

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"What's New"

How many think suturing nerves is a new operation? Well, it is not. More than 50 years ago, the late Dr. W. E. A. Wyman (who until recently was practicing in St. Petersburg, Fla.) reported the successful suturing of the facial nerve in a filly, which had been severely injured in a runaway.

Neutralization *In Vivo* Of Hog Cholera Virus By Serum

C. G. COLE,* D.V.M., C. N. DALE,* M.A., D.V.M., and R. R. HENLEY,* B.S., M.S.

THE literature on hog cholera serum and virus contains very few reports presenting experimental evidence regarding quantitative relations, *in vivo*, of serum and virus. Although there is a rather general opinion that a standard dose of serum will satisfactorily protect against doses of virus much larger than those regularly used, there is no available evidence as to whether the minimum amount of serum required to protect against a small amount of virus will also protect against a very much larger amount. Another point upon which there is very little experimental evidence is how much or how little virus, when used with serum, will afford satisfactory immunity. Work was, therefore, undertaken to obtain evidence on these points.

Amount of Virus Neutralized *in vivo* by a Minimum Protective Dose of Serum

The general plan of this work was (1) to titrate a virus, or to determine its minimum lethal dose, (2) to determine the minimum dose of serum required to protect against 2 cc. of the virus, (3) to give a number of pigs the minimum protective dose of serum, to divide them into groups, and to give different groups different amounts of virus simultaneously with the serum.

Experiment 1

The virus used was BAI virus 286, unphenolized, frozen at —40 F. which had at 113 days produced cholera in two pigs that were injected with 1/1,000,000 cc. and produced cholera in one of two injected pigs that received 1/5,000,000 cc. When used in this experiment, the virus was 132 days' old but in a later titration test at 257 days it produced cholera in 1/1,000,000 cc. doses. The virus therefore contained at least 1,000,000 lethal doses (m.l.d. per cubic centimeter).

The serum used was a commercial serum no. 100**. In tests against BAI virus 186, 10 cc. was the minimum dose of this serum that afforded complete protection against 2 cc. of the virus. Six pigs were given 10 cc. of serum, then divided into groups each of which received different amounts of virus.

The amounts of virus used, with the results of the injections, are shown in table 1.

TABLE 1. Effect of Different Doses of Virus Against a Minimum Protective Dose of Serum

No. pigs treated	Serum dose cc.	Virus dose cc.	Results
2	10	2	2 normal
2	10	50	2 normal
2	10	100	2 normal
2	0	2	1 sick 4th day, killed for virus 9th day 1 sick 5th day, died 9th day

The results indicate that the minimum amount of serum (10 cc.) required to protect against a dose of 2 cc. of a virus containing 2,000,000 m.l.d. was sufficient to protect against a 50-fold increase of virus; that is, 100 cc. or 100,000,000 m.l.d. However, it does not necessarily follow that the amount of a serum that will protect against 100 cc. of one virus will protect against 2 cc. of some other virus. To obtain information on that point, the following experiment was carried out.

Experiment 2

In this experiment four different viruses were used; two were of commercial origin, one was regular BAI virus, and one a variant strain of hog cholera virus, variant virus 1B†.

Each virus was titrated and the smallest dose of each that produced cholera was:

*Pathological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture, Washington, D. C.

Doctor Cole is in charge of the Hog Cholera Research Station, Ames, Iowa.

**Numbers assigned to commercial serums and viruses are laboratory numbers.

†Variant virus 1B is described in the paper, Variations (Variants) of Hog Cholera Virus by Dale, Schoening, Cole, Henley and Zinober, of the Pathological Division, Bureau of Animal Industry, ARA, U. S. Department of Agriculture. (see *Jour. Am. Vet. Med. Assn.*, 118:279 [May], 1951).

BAI virus 286	1/1,000,000 cc.
Commercial virus 50	1/ 10,000 cc.
Commercial virus 51	1/ 10,000 cc.
Variant virus 1B	1/ 1,000 cc.

The serum used was a commercial serum no. 101. This serum had been titrated previously against 2 cc. of BAI virus 286 using the same lot of pigs that was used later in the test of the four viruses. A 10 cc. dose of the serum was the minimum dose that protected against BAI virus 286 without producing visible symptoms of cholera.

The details of this test are given in table 2.

In this experiment 10 cc. of commercial serum no. 101 protected against 100 cc. or 100,000,000 m.l.d. of BAI virus 286. It also protected against 40 cc. of one commercial virus or 400,000 m.l.d., and against 50 cc. of another commercial virus or 500,000 m.l.d. The serum failed to give any protection against 2 cc. of variant virus 1B or 2,000 m.l.d. No protection was expected against 2 cc. of variant virus 1B by 10 cc. of serum as previous tests had indicated that large doses of serum were required to protect against this variant virus.

Experiment 3

The Amount of Virus Required, when Administered with Serum, to Produce Immunity

There is considerable variation in opinion among veterinarians regarding the amount of virus that should be used along with serum in the simultaneous method of protecting hogs against hog cholera. The recommended dose is usually 2 cc. In work carried out at Ames in 1921 and unreported in detail, satisfactory immunity was obtained with 1/100 cc. of virus. No record has been found of the use of smaller doses than that. An experiment was therefore, undertaken to find out whether lasting immunity could be produced by treating hogs with serum plus virus in amounts less than 1/100 cc.

The virus used in these tests was unphenolized BAI virus 286 that had been held at —40 F. for 301 days when used. The serum was a commercial serum no. 101. Pigs were treated with serum plus different doses of virus on July 20, 1950 and remained normal. On October 24, 1950, all of the serum-virus-treated pigs along with two serum-alone-treated control pigs that had been held with them, were exposed by injecting each with 2 cc. of BAI virus 296.

The doses of serum and virus used and the results of the challenge of immunity made 96 days after treatment are shown in table 3.

The pigs used in this test were a uniform lot weighing between 50 and 65 lb. The serum dose was below the minimum recommended for that weight of pigs but was twice the amount found in previous experiments to be required to protect against 2 cc. of the simultaneous virus used in the test.

TABLE 2. Effect of Different Viruses Against the Minimum Dose of Serum Required to Protect Against 2 cc. of One Virus

No. pigs treated	Serum dose cc.	Serial no. of virus	Virus dose cc.	Results	% adequately protected*
6	10	50 Com.	2	5 normal 1 had slight reaction but recovered	100
2	10	50 Com.	50	2 normal	100
2	0	50 Com.	2	2 died	0
6	10	51 Com.	2	6 normal	100
2	10	51 Com.	40	2 normal	100
2	0	51 Com.	2	2 died	0
2	10	†286 BAI	2	2 normal	100
2	10	286 BAI	50	2 normal	100
2	10	286 BAI	100	2 normal	100
2	0	286 BAI	2	1 died 1 had severe reaction but recovered	0
6	10	1B Var.	2	5 died 1 had severe reaction but recovered	0
2	0	1B Var.	2	2 died	0

*Pig with only a slight reaction considered adequately protected.

†BAI virus 286 was titrated when 257 days' old and was used in the above test when 273 days' old. Results of other tests have indicated that unphenolized viruses held at —40 F. retain their virulence unimpaired.

The results were clear-cut. The serum-alone-treated control pigs developed cholera and all serum-virus-treated pigs were completely protected regardless of the amount (between 1/10,000 and 50 cc.) of simultaneous virus that they received.

Experiment 4

In this test only one virus was used, variant virus 1B, and the dose of serum no. 102* was much larger than the amount used in previous experiments because it had been determined previously that larger doses of some serums were required to protect against this variant strain of virus. Four pigs were injected with 30 cc. of serum and 2 cc. of variant virus 1B; four other pigs were injected with 30 cc. of serum and 1/10 cc. of variant virus 1B. The pigs were isolated for 91 days and were then exposed to cholera by virus injections in doses of 2 cc. All pigs remained normal after exposure. In this experiment, the pigs that received 1/10 cc. of variant virus 1B and 30 cc. of serum were apparently as well protected when later challenged with regular virus as were the pigs that received 2 cc. of variant virus 1B and 30 cc. of serum.

TABLE 3. Results of Immunity Tests Made on Pigs Treated 96 Days Previously with Serum and Different Doses of Virus

No. pigs treated	Treatment on July 20, 1950 Serum dose cc.	Virus dose cc.	Results of injection of 2 cc. of virus October 24 (96 days after treatment with serum and virus)
2	20	1/10,000	2 normal
2	20	1/ 1,000	2 normal
2	20	1/ 100	2 normal
2	20	1	2 normal
2	20	10	2 normal
1	20	45	normal
1	20	50	normal
2	20	0	1 sick 4th day, severe reaction, recovered 25th; 1 sick 4th day, died 13th day

*This serum was not titrated to determine the minimum dose that would protect against variant virus 1B.

Summary

1. The minimum amount of a hog cholera antiserum (10 cc.) that protected hogs against 2 cc. of a regular virus also protected against as much as 100 cc. of the virus, thus indicating that the *in vivo* reaction that occurs between serum and virus in simultaneously treated hogs is not a quantitative one.

2. The same dose of a serum that protected against 2 cc. to 100 cc. of regular virus did not protect against 2 cc. of a variant hog cholera virus.

3. Pigs treated with doses of virus as low as 1/10,000 cc. plus 20 cc. of serum were found to be immune when challenged with 2 cc. of virus 96 days after treatment, whereas control pigs that received serum alone succumbed to cholera when similarly challenged.

4. Pigs that received a variant virus in 1/10 cc. and 2 cc. doses plus 30 cc. of a serum were found to be immune when challenged 91 days after treatment.

5. In general, the results of these experiments indicate that too large or too small a dose of active virus is not an important factor in establishing immunity or in causing post-vaccination losses.

Women's Veterinary Medical Association

The 5th annual meeting of the Women's Veterinary Medical Association will be at dinner on Tuesday, August 21, 1951, Parlor A, Hotel Schroeder; after the second day of sessions of the A.V.M.A. in Milwaukee. All members are urged to advise Dr. Margaret Sloss, president, 1220 Lincoln Way, Ames, Iowa, in order that arrangements may be planned. All women veterinarians are cordially invited.

CVC '10 Reunion

The class of 1910 of Chicago Veterinary College is planning a reunion during the A.V.M.A. convention in Milwaukee. This get-together will be held on Tuesday, August 21, 1951, at the Hotel Schroeder.

Dr. Joseph S. Barber, 560 Pleasant Street, Pawtucket, R. I., is anxious to get in touch with classmates and would like to hear from those interested in attending the reunion.

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Progress can come only from new and frequently daring hypotheses.

The Effect Of 4-aminopteroylglutamic Acid (Aminopterin), A Folic Acid Antagonist On Experimentally Produced Avian Leukosis

E. P. JOHNSON,* D.V.M., Ph.D., Blacksburg, Virginia

THE need for certain vitamins in adequate nutrition of poultry has been well established. The need for these growth factors in tumor growth has been indicated but less firmly established. Woll[1] found that when baby chicks were maintained on a folic-acid-free diet, the Rous tumor would not develop when inoculated experimentally into such chicks. Certain of the folic acid derivatives were also found to completely or partly inhibit tumor growth, but may be associated with toxic effects. These actions were contingent on early and continued treatment. Moreover, he found that the addition of folic acid to a folic-acid-free diet materially increases the incidence and apparently enhances the growth of the tumor. Little, *et al.*,[2] reported that the Rous chicken sarcoma was completely prevented by maintaining the birds on a synthetic, folic-acid-free diet from the time of inoculation with the causative virus. Their report also indicated that the Rous sarcoma was prevented by treating the birds with antagonists of folic acid. Oleson[3] found aminopterin to be the most potent folic acid inhibitor of several tried on growth of the Rous sarcoma.

Sharpless, *et al.*,[4] in working with two additional types of neoplastic disease of chickens found that the folic acid requirement was similar to that of the Rous sarcoma in each case. One of these is due to an erythroblastosis strain referred to as RPL-3, which appears to have many characteristics in common with the one used in these experiments; the other was due to a lymphomatosis strain referred to as RPL-12, and previously described by Olson[5].

When 4-aminopteroylglutamic acid (aminopterin) was studied in human leukemia Stickney, *et al.*,[6] reported remissions lasting up to four months in cases of five of 21 children and three of 33 adults. Farber, *et al.*,[7] reported on the use of aminopterin in the treatment of five cases of acute leukemia in children. The remissions were temporary but considered encouraging in the direction of further research.

From the above mentioned reports it seemed desirable to learn what effect aminopterin would have on the course of fowl leukosis produced experimentally with the Beltsville strain A virus which characteristically produces a leukemic blood picture as described by Hall, *et al*[8].

Experimental

For these experiments, day-old chicks, predominantly of the New Hampshire Red breed, were received from the poultry department of this institution. These were kept in electric brooders away from other chicks. When two to four days of age, they were inoculated intraperitoneally with heparinized blood containing the leukosis virus. A high percentage of these inoculated chicks usually developed an acute form of erythrogranuloblastic leukosis in from three to six weeks following the inoculations. The results and progress of the disease were studied by microscopic examinations of stained blood smears made weekly of all chicks. As soon as these examinations revealed a leukemic blood picture the chick was placed in an individual cage in another room and aminopterin was added to all feed which was given it. A few early trials were made, using 2 to 6 mg. per kg. of feed and on the basis of these, 4 mg. per kg. of feed seemed most satisfactory. In most instances, therefore, this amount was given unless otherwise stated. As soon as the blood picture returned to normal and the bird revealed no other evidence of disease, aminopterin was discontinued and the bird was placed in a colony house with other similar birds where they were fed mash supplemented with grain and where they had access to an outside yard.

Some of these birds were kept as long as 20 months after discontinuing the treatment. When the experiment was terminated all birds were killed and checked for lesions. A few birds developed visceral lymphomatosis at varying lengths of time following the termination of the treatment. Table 1 summarizes the results.

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A certain number of similar chicks that developed the disease, as determined by an examination of stained blood smears, were retained without treatment and kept under similar conditions until they either recovered or the disease produced death of the birds. Table 2 summarizes the results.

It is interesting to note in table 1 that 45 of the 91 treated birds made clinical recoveries which lasted more than two months; some as long as 20 months. In all of these, treatment was started as soon as there was a leukemic blood picture, *i.e.*, a stained blood smear made at this time contained a preponderence of large lymphoid-like cells which with Wright's stain revealed a slight rim of cytoplasm of pale-blue color and a large dark-blue vesicular nucleus in which one or more nucleoli could be detected. These cells have been referred to by Jordan[9] as hemocytoblasts. From a study of this material, these cells appear to serve as ancestral cells for immature forms of the erythro and myeloid series which are both affected by this strain of virus.

It is significant to note in table 2 that when no treatment was used on similarly affected chicks, 57 of the 72, or approximately 80%, died of leukosis. It is not 100% fatal, however, and a few chicks that develop an unquestionable leukotic blood picture make clinical recoveries. In this case six of 72 birds recovered clinically and remained free of leukosis for ten months. Eight recovered as far as the blood picture was concerned but later died of visceral lymphomatosis, all having an enormously enlarged liver and spleen typical of this form.

TABLE 1. Results of Feeding 4 mg. Aminopterin Per Kilo of Feed to Birds Experimentally Affected with Erythrogranuloblastic Leukosis

Number of birds treated	Duration of treatment	Number of birds that did not respond to treatment and died of leukosis	Number of birds that died of visc. lymph. from 1 to 12 months after cessation of treatment. Average 4½ months.	Number of birds that recovered and remained free of leukosis for more than 2 months after treatment was discontinued.
91	2 to 133 days average 29 days	33 2 died from other causes	11	45

TABLE 2. Results Among Birds Inoculated Similarly to Those in Table 1 and Received no Treatment

Number of birds	Number of birds that died of leukosis	Number of birds that died of visc. lymph. during a 2 to 10 months' observation period after inoculations were made	Number of birds that recovered and remained free of leukosis for 10 months
72	57 1 from injury	8	6

Discussion

The results of feeding aminopterin to young chickens as treatment in experimentally produced leukosis with the Beltsville strain A virus are sufficiently clear-cut in these experiments to indicate that this folic acid antagonist has a definite role in suppressing the activity of this virus. With this strain of virus, the progress of the disease is directly proportional to the degree of response in the cellular elements of the blood. It appears, therefore, that aminopterin is effective under the conditions of these experiments in inhibiting the folic acid requirement of this virus for metabolism and multiplication. Since about an equal proportion of birds in the two groups developed visceral lymphomatosis several weeks to several months after the inoculations and after the treatment was discontinued, it is impossible to state whether or not these cases were in response to the inoculations or of spontaneous origin. Occasional cases of visceral lymphomatosis occur in uninoculated birds from this source but the incidence is not high. It appears that in the treated group aminopterin was not effective in preventing visceral lymphomatosis in the length of time that it was used. If this antagonist can be administered in such a way as to be equally effective in prevention and treatment of visceral and other forms of fowl leukosis under practical conditions it will be of enormous value to poultrymen.

Summary

New Hampshire Red chicks in which erythrogranuloblastic leukosis was experimentally produced were treated with 4-aminopteroylglutamic acid (aminopterin) a folic acid antagonist, at the rate of 4 mg. per kg. of feed as soon as the disease was established. The

duration of treatment was from two to 133 days, with an average of 29 days. Forty-five of the 91 treated birds made clinical recoveries that lasted from two to 20 months after the treatment was discontinued. Thirty-three did not respond to treatment and died of erythrogranuloblastic leukosis, while 11 later developed visceral lymphomatosis and died.

Of 72 similarly affected chicks, not treated, 57 died of erythrogranuloblastic leukosis; six recovered and remained free of this type of leukosis for ten months while eight made clinical recoveries and later developed visceral lymphomatosis which terminated fatally during an observation period of from two to ten months after the virus inoculations.

Acknowledgment

The aminopterin used in these experiments was received through the courtesy of the American Cyanamid Company (Lederle Laboratories Division), Pearl River, N. Y.

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Prescience

Fifty-six years ago (6th International Veterinary Congress, Berne, Switzerland, 1895) Bernhard Bang of Copenhagen predicted: "The battle against (bovine) tuberculosis will last for many years but in the end will lead to victory."

Effects of Inhalation of Chlordane Vapors upon Young Chickens

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This experiment was initiated to determine the effects upon young chickens of prolonged inhalation of vapors arising from chlordane used as a residual premise insecticide.

Animals and Materials Used

White Leghorn cockerels and pullets 48 days of age at the beginning of the experiment were used. These young chickens had been raised at the laboratory from day-old hatchery chicks and had no previous exposure to insecticides.

Three wire-mesh cages, 22 x 20 x 15 inches, were fitted with plywood cover boxes just large enough not to contact the sides and top of the cages. Two sides (the front and back) of these boxes were provided with openings equivalent to 9.13% of the interior surface area of the cover box. Each cover box presented an interior surface of 2,070 square inches, of which 189.06 square inches were the openings for ventilation. The cages, with their cover boxes in position, were placed on a solid platform inside a 10 x 10 foot shed-roof poultry house similar to that described in Bulletin 65 of the A. & M. College of Texas.

The interior surfaces of the top and four sides of two of the cover boxes were treated by brush application with a 5% solution of chlordane† in acetone to yield a deposit of 1 gm. or 1,000 mg., per square foot. The third cover, designated as the control, was treated with acetone only, using the same quantity of acetone as was used to carry the chlordane in treating the other two covers. Each cover box then contained 1,880.9 square inches of treated surface.

Experimental Methods. One cockerel and one pullet were placed in each cage and the cover boxes put in place as soon as the acetone had evaporated following treatment.

Except for necessary cleaning of the cages and feeding of the chickens, the covers were kept on the cages continuously for 30 days. The birds were observed daily for possible symptoms. Food consisted of whole milo, cut

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*U. S. Department of Agriculture, Agriculture Research Administration, Bureau of Animal Industry.

†Technical chlordane equivalent to 60% octachloro-4,7-methanotetrahydroindane and 40% related compounds was used in the experiment.

Efficient Poultry Inspection Service*

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IT is planned to restrict this discussion to the principles and procedures followed by the federal inspection service in carrying on its work and to some of the results that have been achieved.

In 1928, some members of the poultry industry requested the U. S. Department of Agriculture to establish a poultry inspection service to assure the wholesomeness of poultry products. No federal funds were available for this purpose and the Department established the service with the understanding that the costs involved in the conduct of this program would be met by the members of the industry utilizing the service.

The purpose of inspection is to protect the interests of consumers and thus to increase consumer demand by identifying wholesome products. An experienced Bureau of Animal Industry, Meat Inspection Division official was secured to organize, inaugurate, and administer the service. Following sound established principles and procedures, the service has grown in size until it now has a staff of more than 180 veterinarians and 20 lay inspectors.

The following five conditions must be met by any meat inspection service to be recognized as established on a sound basis:

1. The inspecting and supervisory staff must be competent and there must be a sufficient number of professional workers available to assure scientifically accurate disposition of all carcasses.

2. The members of the staff must be free from political and economic pressure. This means not only tenure of office so long as they competently perform this work, but also, remuneration commensurate with professional training, experience, and living standards.

3. The organization of the inspection service must be such that the administrator feels responsible to the consumer and that the same concept is instilled in his entire staff. The administrator must, of course, have full authority to control the actions of his subordinates and be held responsible for their actions. In so doing he must have sufficient competent supervisory personnel.

4. No one connected with the inspection service can have a financial interest in the product or in a competing product.

5. The administrator must have authority to require proper plant equipment and facilities.

These principles have been applied by the Meat Inspection Division of the BAI since its organization in 1906 and were carried over to the poultry inspection service at the time of its inauguration.

Inspection Services

In order to protect the integrity of the product the following services are performed:

1. An adequate postmortem examination of each carcass by or under the immediate supervision of a competent veterinarian, for the purpose of condemning all unfit carcasses and parts thereof.

2. The maintenance of adequate sanitary standards and plant facilities for the preparation, handling, storage and processing of the product.

3. The approval of labels used in the sale of "inspected" poultry and poultry products so as not to allow false or misleading claims.

Before an inspection service is established in a plant, the plant must make application for such service and agree to bear all of the costs incident to the conduct of the service. A regional supervisor of the Production and Marketing Administration then makes a survey of the plant to determine whether the facilities meet the requirements of this service. Generally, it is necessary for the plant to install additional equipment or alter its existing facilities in order to comply with the minimum sanitary standards established by the Department. Blueprints are then drawn up and submitted to the Washington office for approval. A final survey is made after the completion of the alterations and if they are in accord with the approved blueprints, service is inaugurated.

The economic aspect of poultry inspection is of real concern to the poultry inspection service as well as to the industry, and is a

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problem which cannot lightly be brushed aside. The conduct of an adequate inspection service requires funds for administration, supervision, and performance of the work. During the calendar year 1949, the federal poultry inspection service inspected 349,573,627 pounds of poultry. The charges which the Government had to make to industry for this work were approximately $800,000., or a cost of 0.23 cents per pound of poultry inspected.

Abdominal viscera of a naturally infected tuberculosus chicken. Extensive lesions in the liver and the spleen with nodular lesions of the wall of the intestine. This condition would not be recognized on inspection of the live chicken.

To assume that the 0.23 cents per pound covers the cost of inspection to the industry as compared with the cost of eviscerating poultry without inspection would be an error. The increased costs of operation under inspection are very considerable. They may be listed as follows:

1. The cost of properly establishing and equipping a plant so that adequate sanitation and handling practices may be accomplished.
2. The additional labor required to do the job in a sanitary manner and to prevent contamination of the edible parts with intestinal contents, etc.
3. The loss of weight of the inspected eviscerated carcasses as against the uninspected drawn carcasses because all of the viscera, except the kidneys, are required to be removed, as well as the oil sac, and the shanks at the hock joint. Frequently uninspected eviscerated poultry is prepared in such a way as to leave the lungs in, and the oil sac and part of the shanks on the bird.
4. The labor cost of removing the pin feathers prior to packaging. This cost oftentimes is greater than the labor cost of evisceration.
5. Limiting the speed of the operation so that all phases of the operation are handled in a sanitary way and to allow time for an adequate postmortem examination by the inspector.
6. The cost of the condemned birds which could otherwise be sold.
7. During the calendar year 1949, 2,435,233 pounds, or about 0.7% of the total of inspected poultry, were condemned as unfit for food. The average market value would represent approximately $1,000,000.

These items increase the cost of inspected eviscerated poultry from one to three cents a pound over the uninspected product.

Inspection Procedures

Inspection is performed in the following manner: The carcasses are opened and eviscerated. The inspector then examines the external and internal surfaces of the carcasses and the viscera to determine if any abnormalities are present. It is remarkable how perceptive the inspector becomes after he has had experience on the inspection line. The training of the senses of sight, smell and feeling make these senses phenomenally acute, and the inspector is able to detect immediately any abnormalities that are present. The judgment of the abnormality as it affects the wholesomeness of the carcass is then rendered.

The problems confronting the veterinarian performing inspection for wholesomeness as compared with those of the practicing veterinarian dealing with clinical medicine, are considerably different. For example, infectious laryngotracheitis is a very important disease from the clinical standpoint. From a food inspection standpoint, however, it is generally a localized condition and is one of the diseases which causes few condemnations. By contrast, the organism causing swine erysipelas is capable of producing an infection in turkeys, which disease can be successfully treated with antibiotics. This disease is of considerable importance from a food inspection standpoint because flocks of turkeys, of which some are affected, are marketed during an active outbreak. Furthermore, the handling of infected carcasses can induce human infection.

The principles upon which poultry inspection is conducted are the same as those applicable to meat of mammalian origin. They may be expressed in this way. Meat, whether it is of avian or mammalian origin, is unfit for food if:

1. It contains organisms or toxic substances dangerous to the consumer.

2. It contains morbid tissue due to inflammation, degeneration, or neoplasia.

3. It is derived from an animal which shows evidence of an abnormal physiologic state. For example, fever is an abnormal physiologic state. During fever, the metabolic rate is greatly increased and the end products of metabolism accumulate and cause changes in the tissues.

Condemnations

It is not possible to specifically diagnose by such inspection many of the abnormalities which appear with the accuracy that can be attained in the laboratory. The postmortem records of the poultry inspection service specifically cover those conditions which can be accurately diagnosed and provide broad coverage for the septicemic and toxemic diseases, tumors, and the like. The percentage of condemnations for each of the listed causes for condemnation is here given as well as total condemnations for the year 1949.

	Pounds
Total weight inspected	349,573,627
Total weight certified	347,138,394
Total weight condemned	2,435,233

Total number condemned for diseases as follows:

	No. of head	% Condemnations
Tuberculosis	204,585	30.01
Emaciation	17,396	2.55
Septicemia and toxemia	136,782	20.06
Leukosis	75,362	11.05
Tumors	58,761	8.62
Inflammatory processes	92,278	13.53
Parasites	446	0.07
Gout	322	0.05
Bruises	22,532	3.30
Contamination	16,095	2.36
Decomposition	46,544	6.83
Cadaver	3,667	0.54
Overscald	4,638	0.68
Other causes	2,378	0.35
Total	681,786	

The accuracy of the inspector's diagnosis of such conditions as tuberculosis, osteopetrosis, visceral lymphomatosis, myelocytomatosis, and gout, is almost 100%. Classical cases of fowl typhoid, erysipelas in turkeys and ducks, and fowl cholera, are readily recognized. However, many other infectious diseases have such similar lesions that an accurate diagnosis as to the specific etiology is not always attainable. From the standpoint of judging the wholesomeness of the carcass, however, the professional inspector is readily trained to recognize those conditions which affect the physiological state, thus necessitating condemnation.

The inspectors of the poultry inspection service who perform the postmortem work are veterinarians graduated from recognized veterinary colleges and especially subjected to an intensive practical training period of at least two weeks on the inspection line. Up to the present time we have not used lay personnel for postmortem work, although we feel that lay personnel can be trained to assist the veterinarian in postmortem work as is the case in the federal meat inspection service. A firm nucleus of qualified professional men must be maintained so that demands for expansions of the service can be met efficiently. It is planned to use lay inspectors to assist the veterinarian where expert pathological knowledge is not required. The lay inspector has been used extensively for the supervision of processing, labeling, sanitary control, and acceptance of previously inspected products. It is planned that the lay inspectors under the immediate

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EDITORIAL COMMENTS

Hog Cholera Eradication Committee

As reported exclusively in this magazine (*Vet. Med.*, 46:3 [Jan.], 1951), the U. S. Livestock Sanitary Association adopted a motion at its 54th annual meeting in Phoenix, Ariz., November 3, 1950, which provides that a committee on hog cholera eradication be appointed, whose duties during the current year are to survey the hog cholera problem of the United States and formulate general plans for eradication of the disease. A report is to be made to the Association at the 55th annual meeting, which will be held in Kansas City, November 14-16, 1951.

This committee, comprising some 25 members, includes representative swine raisers, officials of swine breeders' associations, meat packers, transportation officials, Farm Bureau officials, state livestock sanitary officials, representatives of the farm press, the A.V.M.A., and of the federal Bureau of Animal Industry and veterinarians engaged in research, in commercial work and in practice. Dr. L. M. Hutchings, Purdue University, is chairman of the committee.

At the call of the chairman, the Hog Cholera Eradication Committee held a meeting at Purdue University, Lafayette, Ind., June 18-19. Nineteen members of the Committee and an approximately equal number of invited guests attended the meeting which occupied two full days plus one night session. The Committee will issue no public releases until its report is presented to the Association at the meeting in November, but it violates no confidence to say that as individuals the members of the Committee are unanimous, or nearly so, in the opinion that hog cholera can be eradicated from the whole of the United States with the knowledge of the disease and the facilities now available; that eradication is practicable from an economic aspect and an eradication project on a national level should be initiated without delay.

It appears that this movement, initiated by the U.S.L.S.A. last year, has been rather lightly regarded. At least, with the exception noted above, the veterinary press has not seen fit to mention it as one of the important developments of 1950. The situation is reminiscent of 1916 when at the 20th annual meeting of this association a resolution was adopted in part as follows, ". . . it is highly desirable that tuberculosis be eradicated from all farm animals, and to accomplish this, systematic and efficient effort should be made and . . . the members of the United States Livestock Sanitary Association in our twentieth annual convention assembled pledge ourselves to render all the assistance possible . . ."

This action was practically unnoted except by this magazine (18 articles on tuberculosis and the tuberculin test in the following year), but the eradication project was launched immediately and for the next 25 years ranked first in veterinary activities. At the 45th annual meeting of the Association, when all the states and every county were modified accredited tuberculosis free areas, Jay Arthur Myers, M.D., Professor of Preventive Medicine and Public Health and a leading national authority on human tuberculosis, appraised the achievement as follows:

"In the entire history of tuberculosis control, there is no accomplishment which even approaches that of the veterinarians and their allies in the United States. There are not sufficient superlatives in the English language to describe adequately your accomplishments and pay the tribute that you deserve."

And again:

"From this came the greatest victory ever won over tuberculosis. It included the solution of one of man's greatest economic problems and also one of his most serious public health problems."

The U. S. Livestock Sanitary Association Hog Cholera Eradication Project may not click; then again, it may. It is the opinion of the writer that its chances favor success. In any case, it is a brave undertaking.

Apropos of this, but not without interest in this connection, is a statement made by Dr. John A. Kiernan when he took charge of the tuberculosis eradication project. Substitution of "hog cholera" for "tuberculosis" gives it additional interest. Doctor Kiernan said: "it is my belief that if this nation succeeds in eradicating (bovine) tuberculosis in 50 years it will be one of the greatest heritages our successors will have handed down to them." That the incidence of the disease was reduced more than 99% in one-half of the period mentioned must indicate the task was not so large as it looked.

Readers may make their own application of another quotation from the same source. It reads: "Mississippi, the first state to complete the eradication of the tick, did not talk them to death, but dipped the cows in her 5,000

concrete dipping vats. The educational campaign in Mississippi consisted not of words, but of deeds; not of lectures, but of dipping vats."—*D.M.C.*

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Relationship of Endocrine Disorders to Acetonemia

Acetonemia in cattle may be a complex manifestation of endocrine disorders. This tentative concept is based on preliminary results of a large amount of experimental work and field trials.

It is much too soon to make positive claims for any single hormone as a therapeutic agent. Furthermore, as has been pointed out in this magazine, acetonemia or ketosis may have different etiology. For a thorough review of some basic research on endocrinology on which any sound treatment of this sort must be based, readers are referred to the series of articles, Hormonal Hypothesis of Prepartum and Postpartum Acetonemia in Dairy Cattle by Dr. Guillermo Puntriano. Part II of this series of three articles appears elsewhere in this issue.

An article entitled, Here's News About Ketosis—Its Cause; Its Cure, by Dr. J. C. Shaw, appearing in *Hoard's Dairyman* for June 25, 1951, will undoubtedly prompt many questions by dairymen. Positive statements as to its curative value in all cases are premature. Cortisone is not available for veterinary use and is in short supply for human use. Its cost for the treatment of livestock is at present prohibitive, except perhaps for animals of exceptional value. Saline suspension of cortisone acetate prepared in 20 cc. vials containing a total of 500 mg. of this synthesized drug, sells to physicians and druggists at $14. per vial. Recommended minimum dose for a cow is 500 to 1,000 mg. or approximately 1 mg. per lb. of body weight. Material cost for treatment, providing that symptoms are relieved on initial treatment, would total between $14. and $28.

Advancements made in the understanding of the pathological processes behind the symptoms of ketosis are in advance of the practical availability of this recommended treatment. Without question, supplies of cortisone at a nominal cost await perfection in manufacturing procedure or development of plant sources.

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A normal pig may be as vicious a carrier of atrophic rhinitis as one having obvious deviation of the snout.—*J. D. Ray, D.V.M.*

School of Veterinary Medicine, Oklahoma A. & M. College, Stillwater, Accredited

The School of Veterinary Medicine, Oklahoma A. & M. College, Stillwater, was accredited May 17, 1951, by the A.V.M.A. This approval strengthens the rank already established for the school by full approval granted by the Bureau of Animal Industry.

A new building is under construction, one wing of which is now completed and occupied. This is known as the Veterinary Medical Center, estimated to have cost $1,500,000. There are 21 faculty members on the staff, headed by Dean C. H. McElrod. The degree of Doctor of Veterinary Medicine was conferred on 26 students who have completed the four-year professional curriculum. The school is cooperating in the 11-state regional education plan with other institutions in the South.

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Canned Whole Milk for Overseas Forces

Whole milk vacuum-packed in cans is now a reality.

This milk, neither condensed nor evaporated, is produced under carefully supervised conditions, and delivered to the milk plant in containers designed to prevent exposure of the product to air. Plant processing includes homogenization, sterilization at 280 F. for eight seconds, and aseptic canning in vacuum-sealed three-quart cans. A new dairy concern, named Med-O-Milk, Inc., East Stanwood, Wash., is reported by *Hoard's Dairyman* as now coming into commercial production.

Credit for development of the necessary production equipment and procedures is given to dairymen Dr. Ray R. Groves and John H. Stambaugh. Keeping qualities of the new product allow for shipment to distant places. Milk stays sweet for several months and has an appetizing flavor.

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Colonel Harry E. Van Tuyl, U. S. Army Veterinary Corps, has been relieved of his assignment at Ft. Leavenworth, Kans., and is assigned as Chief of Veterinary Services for the Far East. He will leave for his new post on July 15, 1951.

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Bovine leptospirosis may cause abortion in beef cattle herds.—*J. A. Baker, D.V.M.*

Dr. John R. Wells, president-elect of the A.V.M.A., will preside at the annual meeting of the House of Representatives in Milwaukee. He will be installed as president at the closing session on Thursday, August 23, 1951.

Directory Advertising

A Midwest veterinarian visiting in the Northwest provided us with the proof of the page in the yellow section of the Seattle, Wash., telephone directory. Listed under the heading "Veterinarians" are the names of local practitioners, and under the heading "Veterinary Hospitals," the named establishments with the cards of director or staff members. There is no display advertising.

Of especial interest on the page is the two-column notice set in bold type, reproduced below, that appears as a precedent having merit.

Membership In The

SEATTLE VETERINARY MEDICAL ASSOCIATION

Stands for

1. VETERINARIANS WHO HAVE EARNED THE DEGREE OF DOCTOR OF VETERINARY MEDICINE.
2. SIX OR MORE YEARS OF SPECIAL WORK AND STUDY TO PRACTICE VETERINARY MEDICINE.
3. VETERINARIANS WHO BY THEIR PREPARATION, QUALIFICATIONS AND MORAL CHARACTER HAVE BEEN APPROVED FOR MEMBERSHIP IN THE LOCAL, STATE AND NATIONAL ORGANIZATIONS.
4. EACH MEMBER MUST CONFORM TO THE ETHICS AND REQUIREMENTS OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION OR LOSE HIS MEMBERSHIP.
5. THIS STANDARD IS MAINTAINED SOLELY TO INSURE THE HIGHEST POSSIBLE QUALITY OF SERVICE TO THE PUBLIC.

A Danger of the Newer Antibiotics

The Council on Pharmacy and Chemistry, American Medical Association, has voted that the warning statement quoted below be added to the labeling of the newer antibiotics now in wide use (*Jour. Am. Med. Assn.*, 145:1267 [Apr. 21], 1951.)

"The new antibiotics, chloramphenicol (chloromycetin)®, aureomycin hydrochloride, and terramycin hydrochloride, are highly bacteriostatic for many bacteria. Susceptible bacteria are suppressed and Monilia or other yeast-like organisms may replace the normal or abnormal bacterial flora. This most frequently occurs in the large bowel and is of little consequence. However, if this replacement occurs in a lung abscess, bronchiectatic cavity, or in certain other lesions, a condition is created which may be unfavorable for the patient. Deaths from pulmonary moniliasis, following therapy with the new antibiotics, are known. Also instances of cutaneous moniliasis mistaken for sensitivity have been noted when the newer antibiotics were used in the treatment of disease."

Little concern has been expressed among veterinarians on this point. Oral administration of these agents, except in selected small animal patients, is limited and in these no evidence has been presented that bowel lesions have resulted from such therapy.

Apparently other parts of the human body may become involved, though no experience by veterinarians to date has confirmed such pulmonary complications as suggested by the Council.

It might be apropos at this time to mention the need for astute clinical observations in all cases in which these antibiotics are prescribed. This duty applies in this respect in the same manner as for any other chemotherapeutic agent.

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Doctors are the front line of our national defense effort and they must be competently trained along present high standards if we are to maintain our leadership in world affairs.—*Harold E. Stassen, President, University of Pennsylvania.*

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The cost of educating a medical student is about $10,000. over the four (professional) years. Maintaining high educational standards in the face of mounting costs poses problems of grave severity.—*James B. Conant, President, Harvard University.*

Research Work and the Practitioner

The achievements in veterinary research have made notable contribution to medical progress during the past half-century.

Today, useful information is being developed by investigators in many sections of the country. In fact, progress has been so rapid in so many fields that it has been virtually impossible to keep up with all of it. It may be said that the future holds promise of still greater discoveries which will assist veterinarians in handling animal diseases.

The practitioner, states an eminent research veterinarian, has much to gain from work now in progress, as have those who are preparing supplies, biological products, etc., for him. New items will continue to be added to the armamentarium of the practitioner.

In the past, research in animal diseases suffered from the lack of financial and moral support. Much animal experimentation has been done on pathological processes as they affect the general health of the population. This public health effort continues with increased tempo. Recently more interest by financial aid and support has made possible research projects for the study of animal diseases from the standpoint of their effect, control and treatment of the animal affected. From this work, much can be expected. Men engaged as researchers have a background of training superior to their predecessors, have been selected for suitability as inquirers, and are provided improved facilities with which to work.

Veterinary and medical research continue to complement one another to the advantage of the owner, practitioner and many others indirectly. The matter becomes one of general economics. The conscientious practitioner will profit in direct proportion to his interest and attention to experimental reports.

Rewards are certain to be an unraveling of knotty problems and the means of their solving.

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Forty years ago, April 14, 1911, the first class of the Terre Haute Veterinary College was graduated. Members included B. R. Kent, Fulton, Ind., Irvin Peters, Arkadelphia, Ark., and W. C. Sprinkle, Indianapolis, Ind.

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Approximately 55% of the American farm income is from the products of livestock, including poultry.

W. M. Coffee, president of the A.V.M.A., will preside at the 88th annual meeting in Milwaukee, August 20-23, 1951.

Based upon reports of state health officers, the U. S. Public Health Service lists more than 10,000 cases of illness in 1949 traceable to water, milk, or other foods. The summary includes 1,570 illnesses, resulting in three deaths, for which polluted water was responsible; 246 infections (no deaths) due to contaminated milk; and 9,043 infections (11 deaths) borne by other foods. The Surgeon General estimates that the illnesses reported as being due to foods other than milk constitute not more than 10 to 15% of all such infections. The infectious agent in food other than milk was in most instances the Staphylococcus, of which milk products and meat and meat products are the principal carriers.

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One patient admitted every 1.8 seconds, a total of 17,023,513, is the record for hospitals in the United States in 1950. This is 363,540 more patients than were admitted to hospitalization in 1949. Babies born in hospitals, however, were fewer last year; 2,815,806 in 1950; as against 2,820,791 in 1949.

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Cattle slaughter under federal inspection for the week ending June 23, 1951, was 21% above the slaughter of the preceding week, but 23% below the figure for the corresponding week last year. Beef production was 101,000,000 lb., compared to 130,000,000 lb. for the same week one year ago.

Chairman, Committee on Local Arrangements

Dr. K. G. Nicholson

Dr. K. G. Nicholson, General Chairman of the Committee on Local Arrangements, has extended an invitation to all veterinarians to attend the 88th annual meeting of the A.V.M.A.

Doctor Nicholson and those associated with him have prepared to entertain the largest number of visitors ever to assemble at a national convention. August weather in Milwaukee usually can be counted on to be pleasant; it is made more enjoyable by cooling breezes from Lake Michigan. For those who wish to extend their vacations either before or after the meeting, the Wisconsin northern woods and lake region offer some of the finest facilities in the land for fisherman and tourist.

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Conference of Constituent Association Secretaries, Editors, and Public Relations Workers

The first joint conference of secretaries of constituent associations of the A.V.M.A., editors of veterinary publications, and public relations workers in all veterinary organizations will be held in Milwaukee next month. In previous years, these three groups have held separate conferences at various times between sessions of the A.V.M.A. convention. Chairmen elected to preside over each of these groups this year voted to hold a joint meeting because of problems of mutual interest and overlapping activities of a large number of the conferees included. Separate afternoon sessions are scheduled to allow for discussion of matters of specific interest.

The conference is scheduled as a presession attraction and will be held in the East Room, Schroeder Hotel, Milwaukee, on Sunday, August 19, 1951, at 9:00 a.m.

Dr. C. D. Van Houweling, Assistant Executive Secretary, has taken the lead in coordinating a program which will feature national figures in these veterinary activities. He has also arranged for a coffee and donut opener at 9:00 a.m. and a luncheon, at which functions those attending will be guests of the A.V.M.A. Mr. W. D. Knox, editor of *Hoard's Dairyman*, will be the featured guest speaker at the luncheon.

All secretaries, editors and public relations workers are urged to attend. It is hoped that a representative from every section of the country will be named. Reservation cards have been provided and if these have not been forwarded to A.V.M.A. headquarters, notice of your intention to attend should be mailed immediately.

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Plans for Women and Children at the A.V.M.A. Milwaukee Convention, August 20-23, 1951

Women and teen-agers attending the A.V.M.A. meeting in Milwaukee next month will find that a full program of activities has been planned for them. Reliable "baby-sitter" service will be available for younger children.

Special events planned for wives include a tea, luncheons, tours, and a style show. Social activities to include the wives of members are a "gemütlichkeit"*, an evening at the Wisconsin State Fair, alumni dinners, and the president's reception and dance.

Special teen-ager events include tours of a zoo and a park, visit to the public museum and library, a "splash party", and movies. The young people may also attend the evening for gaiety and the State Fair with their parents.

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Intravenous puncture of the cephalic vein in dogs is facilitated by bending the needle tube to form an approximate 25° angle with the hub and so that the bevel is inside the angle formed by extension of the syringe adaptor. In this manner, the bevel may be placed against the vein for puncture allowing ease for the injection of syringe contents.—*Wade O. Brinker, D.V.M.*

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Skunks are highly susceptible to rabies.

*Editor's guess—beer, singing, and dancing.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

The season for Rocky Mountain spotted fever, a serious tick-borne rickettsial disease of man, is here again. Veterinarians and others who are in the fields should guard against it. Ticks that have been demonstrated to be vectors are the western wood tick (*Dermacentor andersoni*); the American dog tick (*Dermacentor variabilis*); the rabbit tick (*Haemaphysalis leporis palustris*); and the lone-star cattle tick (*Amblyomma americanum*). Gaining access to the human body, the tick penetrates the skin and anchors itself firmly by means of its biting mouth parts. Ticks may be removed, not by chemicals, but by gentle persistent traction with gloves or other hand protection. If deeply embedded in the skin a hypodermic needle inserted under the tick's head may lift it out or a tent-like piece of skin containing the head may be snipped off with a pair of scissors and the wound treated with an antiseptic. If the tick is crushed in bare hands, thorough washing with soap and water, without hard rubbing, is a precautionary must. For those planning on trips in areas where the vector ticks are indigenous, such as the Rocky Mountain region, also in some Atlantic coast states; immunization with a chick-embryo type vaccine (three injections at intervals of one week), is highly recommended. Booster vaccinations, one or two injections, are advised at yearly intervals. In case of infection, treatment at the hands of an experienced, qualified physician should be as prompt as possible. A 10% DDT powder applied liberally will destroy the ticks infesting pet animals; and in this form is not dangerous to them.

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It cannot be repeated and emphasized too often that garbage intended for swine feed should be handled and stored in a sanitary manner. Before being fed to hogs it should be cooked to prevent the spread of the *Trichina spiralis*, hog cholera and other conditions. It is estimated that one person in six, because of eating raw or insufficiently cooked pork products, has some trichina infection, and swine contract the parasite largely from raw garbage. Veterinarians know that hog cholera virus may live and be spread through pork trimmings even after having been subjected to the usual curing processes.

Histamine, as is well known to veterinarians, occurs in all animals, particularly in the lungs and liver, and also occurs in vegetable tissues. It serves a purpose as a capillary dilator, stimulator of gastric secretion, etc. In normal blood, it is rapidly destroyed. However, when cells are destroyed or injured, the histamine is released in excess so as to result usually in an allergic reaction. The reaction, or at least the reduced response or failure to respond to antihistamines, is lowest when the liberated histamine reacts on the cells liberating it, and the response is best when the reaction is on distant cells.

Many antihistamines are now being synthesized. Antistin is the name of one of these proprietary products; another is phenergan, derived from phenothiazine. In animals, sudden or unusual release of histamine is believed to result in lowered blood pressure, capillary permeability, diarrhea, urticaria, ptyalism, dyspnea, pulmonary emphysema, laminitis, intestinal edema and others. The antihistamines and their therapeutic action still rest on a rather shaky basis but rational use is becoming more evident. Certainly these agents are far from being cure-alls, but in selected conditions they are worthy of trial. Usually an intramuscular injection at 24-hour intervals is the procedure of choice.

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It was more than ordinarily informative to learn, amongst other important items, from the 1950 Report of the Chief of the Bureau of Animal Industry, that one of their anaplasmosis carrier cows (she was a chronic carrier) finally became negative so that an inoculation of her blood into a splenectomized calf did not produce anaplasmosis. However, when this same former carrier was reinoculated with blood from an acute anaplasmosis case, the former carrier "developed acute anaplasmosis." In other words, as interpreted by us, she had developed no resistance to anaplasmosis because of her previous carrier state.

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It has now been definitely determined that death of ducks alleged to be due to the consumption of lead shot is in fact botulism due to *Clostridium botulinum*, type C. This organism flourishes in mud flats and the feather edges of lakes.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
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The Administration of Antiparasitic Drugs in Feed

The majority of drugs for removing and controlling internal parasites of livestock and poultry necessarily must be administered as individual treatments in capsules or drenches, or as prepared tablets, boluses, or pills. A few of these chemicals, on account of a particularly fortunate combination of attributes, including safety, palatibility, stability, and suitable physical nature, can be administered efficiently and economically in feed, drinking water, mixed mineral supplements, or loose salt. Wherever these latter vehicles are safe and practicable, the administration of the drugs in them is generally preferred to other modes of medication. Not only do these methods obviate individual handling of animals, preparatory fasting, tedious calculation and measurement of doses, and other time-consuming and undesirable operations, but they also make possible more efficient systems of parasite prevention and control than have hitherto been devised.

In view of the constant hazard to profitable production that is presented by many helminthic and protozoan parasites, because of their ubiquitous distribution and hidden, insidious effects, the development of practicable systems of preventive medication, based chiefly upon improved methods of administering antiparasitic drugs, is doubtless of comparable importance to the development of the drugs themselves.

The principal antiparasitic drugs that are, or may be, administered in feed are nicotine, sodium fluoride, phenothiazine, sulfur, sulfaguanidine, sulfamethazine, sulfamerazine, sulfadiazine, sulfaquinoxaline, nitrofurazone, nitrophenide, 2,2'-methylene-bis(4-chlorophenol), and 2-amino-5-nitrothiazole.

The first three of these are anthelmintics, ordinarily given in therapeutic doses, in one or a few successive feedings, and only occasionally contained in prepared feeds. They are not only conveniently administered by putting the indicated dose or doses in the immediate ration of the animal or animals to be treated, but also, under the special circumstances of their use, are generally more safely and effectively given in this manner. Their indications and methods of administration are too well known to warrant giving details in these respects.

The administration of tobacco dust in feed for the removal and control of large roundworms of poultry was recommended at least as early as 1922 by investigators at the California Agricultural Experiment Station, and is possibly the earliest form of successful anthelmintic medication that was recommended for administration in feed. It is still the favored treatment of some poultry raisers, although largely superseded by the more reliable nicotine sulfate, commercially sold as Black Leaf 40. The advantages of group treatment of chickens, as opposed to individual treatment, must be entirely evident, and this method of treatment has been used successfully for nearly 30 years.

In the case of market hogs, the sodium fluoride treatment, developed in 1945, offers a comparable advantage. Phenothiazine, the most useful of all livestock anthelmintics, may be given in therapeutic doses in feed to individual animals of any class, or it may be administered in this manner as a group treatment for sheep, goats, swine (for nodular worms) and poultry. It may be given also by free-choice administration in loose salt or other mineral mixture for the prevention of parasitism in sheep and goats. A few preparations containing phenothiazine are marketed for specific administration in feed to poultry, and one or more companies may sell prepared mineral mixtures containing phenothiazine for use in sheep. Otherwise, this remarkable anthelmintic, as well as sodium fluoride, nicotine and tobacco, are rarely marketed as ingredients of prepared feeds.

The next nine drugs, hereinafter listed, are used for the prevention and control of poultry coccidiosis, chiefly the cecal form of the disease, caused by *Eimeria tenella*. The pertinent details concerning their use are, in brief, as follows:

Sulfur. Flowers of sulfur, 5% by weight in mash for five to seven days to chicks four weeks of age or older; 2.5% thereafter up to 14 to 16 weeks of age, for checking outbreaks and preventing losses when birds must be reared on grossly contaminated soil.

Micronized sulfur, 3% in mash, otherwise used as above for five to seven days.

Flowers of sulfur, 2.5% in mash for seven to ten weeks, used preventively on heavily infected premises. Used as described, sulfur is also of some value for minimizing losses from intestinal coccidiosis in older birds. Sulfur is sold by many concerns and is rarely, if ever, premixed with feed.

Sulfaguanidine. Add 1% by weight in mash for three or four days, continued another day or two if losses are not promptly checked; course of treatment repeated if disease recurs. One and one-half per cent is necessary and sometimes used to prevent intestinal coccidiosis caused by *Eimeria necatrix*. This chemical, and sulfamethazine, sulfamerazine and sulfadiazine, are marketed by the Lederle Laboratories. Usually, they are sold directly to poultry producers, although some may be sold in feeds by feed manufacturers.

Sulfamethazine. Add 0.5% in mash for three or four days to check outbreaks; 0.2% in drinking water (1 oz. to 4 gal.) for six or seven days, using soluble sodium salt, for same purpose.

Sulfamerazine. Same as for sulfamethazine.

Sulfadiazine. Same as for sulfamethazine.

Sulfaquinoxaline. Add 0.0125% (1 oz. in 500 lb.) in mash for first eight weeks or 0.0066% in drinking water (1 oz. in 117 gal.), of sodium salt, for prevention; 0.1% in mash for two days, or 0.04% in drinking water, for checking outbreaks. If necessary, half these concentrations are repeated after a lapse of three or four days.

This drug, a product of Merck & Co., Inc., is presumably sold only to feed and veterinary products manufacturers. Only pre-mixes and finished medicated feeds are ordinarily available to poultry raisers.

Nitrofurazone. Add 0.0056% to 0.0069% in all-mash feed from two weeks of age to from eight to 15 weeks of age, for prevention; 0.0112% (twice the above concentrations) for four or five days, for checking outbreaks.

Nfz-mix, containing 11.2% nitrofurazone, 1 lb./ton for prevention (2 lb./ton for control) and NFZ, containing 1.1%, 1 lb./175 lb. mash for prevention (1 lb./100 lb. for control) are sold exclusively by Dr. Hess and Clark, Ashland, Ohio. So far as known, the pure drug is not ordinarily available to veterinarians or producers.

Nitrophenide (m,m'-dinitrodiphenyl disulfide). Add 0.0125% in feed as continuous low-level medication for prevention (1 lb. of megasul per ton of feed); 0.05% in feed (4 lb. per ton) for checking outbreaks. This is used for periods of three to four days, alternating with low-level medication. Drug is discontinued on broilers about four days before slaughter. Megasul (Lederle Laboratories), containing 25% nitrophenide, is the only available product. It is sold directly to feed manufacturers.

2,2'-methylene-bis(4 - chlorophenol). This chemical, also known as parabis and K3579, is marketed as parabis-90, containing 90% of the chemical. It is a product of the Dow Chemical Company and is sold directly to feed manufacturers. It is incorporated in prepared feeds in amounts of about 3.5 lb. per ton.

Approximately 0.15% in feed for prevention of cecal and intestinal coccidiosis, beginning when chicks are one or two days old and fed continuously for ten to 14 weeks, or up to the time of slaughter.

The last drug, namely, 2-amino-5-nitrothiazole, is marketed as a 20% concentration, known as enheptin, by the Lederle Laboratories. It is sold for the prevention and control of blackhead in turkeys. It is fed continuously at a level of 0.05% (pure chemical basis) for prevention, and for periods of five to ten days at a level of 0.1% to check outbreaks. The drug is discontinued 14 days before slaughter.

The question of administering antiparasitic drugs in feed has been reviewed rather comprehensively because it has given rise to confusion and controversy, not only among veterinarians and parasitologists, but also among legislators and law-enforcement officers. Undoubtedly, the development of antiparasitic chemicals that lend themselves to administration in feed, particularly for swine and poultry, is definitely advantageous. Moreover, the development of systems of planned, preventive medication against parasites is an important, forward step. Those who entertain misgivings about the marketing of medicated feeds and pre-mixes should, therefore, avoid the risk of any general reaction against the administration of antiparasitic drugs in feed, mixed mineral supplements, loose salt, or drinking water. However, the question of the sale of medicated feeds and pre-mixes, on which opinion may vary, concerns five of the aforementioned drugs, namely sulfaquinoxaline, nitrofurazone, nitrophenide, parabis, and enheptin.

Regarding the method and extent of control exercised over these drugs, it should be borne in mind that, by law, all feeds, pre-mixes, mineral mixtures and other preparations of this class which contain antiparasitic chemicals when sold, are marketed as drugs, notwithstanding the fact that most are processed by feed manufacturers. None are marketed as

feeds. Under such arrangement, there is little chance that medicated feeds can escape adequate control. Moreover, disasters and misuse could provoke more rigid controls. It should be noted, further, that feed manufacturers are equipped to make the exacting feed mixes required and that consumers are not. The usefulness of the products is also a paramount consideration. Some of them are comparatively new, and changes in their methods of use are certain to come; yet the record of experience to the present time seems to indicate that significant, if not unprecedented, benefit is being achieved by their use. In addition, the drugs in question, under the conditions of their use, are not cumulative and therefore present no risk to human consumers. Finally, prepared medicated feeds undoubtedly serve best the commercial producers of chickens and turkeys, and these producers are in a position to use them most satisfactorily. Undoubtedly, they are more likely than ordinary farmers to abide by a prescribed regimen and less likely than they to be overly-generous with expensive, medicated feeds.

In these paragraphs, there has been no intention of expressing an opinion on the sale of prepared feeds containing antiparasitic drugs. Rather, the attempt has been made to present some of the facts and considerations which should be borne in mind in connection with the larger problem of administering these chemicals in feed or other free-choice vehicles.

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Efficient Poultry Inspection Service

(*Continued from page* 317)

supervision of veterinary inspectors will be employed to examine each entire carcass including all parts, organs, and body tissues. By following easily understood instructions, the lay inspector will sort the abnormal carcasses into the following three categories:

1. Those carcasses which show readily recognizable morbid conditions which always necessitate condemnation of the entire carcass. He condemns such carcasses as unfit for food.

2. Those carcasses which show readily recognizable changes which are always localized and do not necessitate condemnation of the entire carcass. He passes such carcasses for food after removing and condemning the affected parts.

3. Those carcasses which are abnormal and do not fall into the above two categories. Such carcasses are retained for judgment and disposition by a veterinary inspector.

In conclusion, it should be emphasized that present day poultry inspection is an industry-demanded service for the purpose of recommending to, and safeguarding poultry meat products for, the consumer. In conjunction with the poultry grading service with which it is coordinated, the poultry inspection and grading services are believed to offer to the consuming public an adequate assurance as to the wholesomeness and table quality of poultry meat products.

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Effects of Inhalation of Chlordane Vapors upon Young Chickens

(*Continued from page* 314)

yellow corn and wheat, green vegetables, and water.

Results. This experiment was conducted during November and December 1950. The mean temperature during the period was 52 F., the low 13 F., and the high 84 F.

One chicken exposed to chlordane vapors developed a fatal sinusitis. This was not due to chlordane, since the same condition existed in the reservoir stock of chickens. All other chickens grew well and remained in excellent health. No clinical abnormalities developed, except for the case of sinusitis mentioned.

On the thirtieth and final day of exposure, one chicken from each cage was killed and subjected to detailed autopsy. No gross pathological lesions were found.

Tissues from the killed birds were prepared for histopathological study. No microscopic lesions attributable to chlordane were found.

Conclusion

Under the conditions of this experiment, no ill effect was observed in young chickens exposed continuously for 30 days to the vapors arising from surfaces treated with 1,000 mg. of chlordane per square foot.

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Fractures in Large Animals

I consider the treatment (of fractures) of the humerus and femur (in large animals) should not be considered for the reasons previously given, but I see no reason why shaft fractures of the tibia, radius, ulna, metacarpus, and metatarsus should not be treated in both the horse and the ox if suitable appliances and technic can be devised and (if) the lay mind can be educated to accept it as likely to be successful. — *A. C. Shuttleworth, Vet. Rec., 63:251 (Apr. 7), 1951.*

PUBLIC HEALTH

JAMES H. STEELE, D.V.M., M.P.H.
Atlanta, Georgia

Rabies

During the first quarter of 1951, rabies has broken out in domestic and wild animals in many states where the disease has not been recorded in decades, according to *Public Health Reports*. The cities of Spokane in Eastern Washington and Billings, Mont., reported outbreaks in dogs. These two areas have been free of rabies for a number of years. The disease was reported in skunks in Nebraska and South Dakota. Previously skunk rabies had been observed in Southern Minnesota and Iowa. The Missouri Department of Health reports that an epidemic is raging in the city and county of St. Louis and that over 200 reports of rabid animals have been received so far this year. The Mississippi Board of Health has reported an outbreak in foxes, cattle and dogs in the northern part of that state. There has also been a report of a rabies epidemic in Natchez. The Maine Department of Health and Welfare reports a positive fox head which was confirmed by the Public Health Service.

The State Health Department in Georgia recently released a report on their 1950 rabies control activities. There were 144,598 animals immunized. There were 303 positive heads of dogs, 54 foxes, 26 cats, 19 cows and six others for a total of 408 positive cases. There were 894 treatments of human beings. Clinical cases of rabies were reported in 118 dogs, 85 foxes, 13 horses, 87 cattle, 13 hogs, and nine cats. Treated after exposure were 315 dogs, 33 hogs, 144 cattle and 49 horses.

This latter group was quite interesting inasmuch as it was not realized that many animals are treated for rabies after exposure. Further information on these reports may be obtained from Dr. L. E. Starr, Public Health Veterinarian, Georgia State Health Department, Atlanta.

Japanese rabies statistics for 1950 disclose that there were over 800 cases in dogs and that almost 2,000 persons were bitten, with 52 deaths. This is a high mortality rate in man, being approximately 2.5%. Rabies has been a serious problem in Japan for a number of years but in the post-war period it has become much greater than at any time previously.

The General Headquarters of the Supreme Commander for the Allied Powers, Public Health and Welfare Section, reports in Bulletin 174 for the period, February 15-28, 1951, on rabies control programs in Japan as follows:

"A nation-wide survey of enforcement measures taken by prefectural officials since the inception of the Rabies Control Law No. 247, 26 August 1950 up to 31 December 1950 revealed that 855,830 dogs had been registered, and 847,503 dogs immunized. In addition, 786 dog catchers had been employed and 339 dog pounds put into operation. While the results so far are considered commendable, the program is aimed at having the estimated total of 2,000,000 dogs registered and immunized immediately. A total of 800 dog pounds, one for each health center district, with the permanent employment of at least 1,600 dog catchers is proposed. An effort is also being made to obtain transportation for the dog catchers in the form of foot-driven or motor-driven tricycles with cage carriers attached."

This is an ambitious program. It points out the necessity of having good stray dog control measures in rabies control. Any community planning eradication of rabies must have good dog pounds and wardens. A dog warden must be an intelligent man, and very often a born diplomat, to handle some of the difficult situations encountered in carrying out effective measures. He is a good right arm of any veterinary public health program in the control of rabies.

Control and eventual eradication offer a challenge to veterinary public health in the United States. It has been demonstrated that the immunization of dogs with canine rabies vaccine is successful in controlling the disease in many areas. In addition, it is also essential that unwanted stray dogs be removed. In the past four or five years, wild animal rabies has assumed an increasing importance in nearly all parts of the United States, and it is this problem that offers the biggest hurdle in the eradication of the disease as a public health and animal health problem. Cooperation by public health, wild life conservation, livestock sanitation and veterinary officials will be necessary for control and eradication.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Hereditary Atresia of the Oviduct

An hereditary atresia of the oviduct in a large number of chickens on one farm is described by Finne and Vike (*Poultry Sci.*, 30:455, [May], 1951). This abnormality was traced to one male which, when mated to normal hens, produced 93 daughters consisting of 50 normal layers and 43 non-layers. Of 37 non-laying daughters which were submitted for postmortem examination, 36 had defective oviducts and one was normal. In these cases, the common defect was the absence, or marked stricture, of the isthmus of the oviduct. In some birds, there were two strictures with an intervening cyst. In a few, no opening from the vagina into the cloaca could be observed.

The females suffering from these hereditary defects, grew normally until mature, and then were observed for several days to go to the nest in attempts to lay. Eventually the affected bird would develop a penguin-like posture, and if not killed, would finally die. At necropsy, the abdominal cavities always contained eggs in various stages of development and decomposition. Ruptured oviducts, anterior to the strictures, allowed the eggs to drop into the abdominal cavity. Peritonitis was often noted.

In four sons of the male, three showed a stricture of at least one of the seminal ducts, indicating a transmission of the sub-lethal gene to the male as well as to the female offspring. The defect in the males was not lethal.

According to the authors, this is the first proved record of hereditary atresia in chickens. This defect may account for many instances of "internal layers" observed on poultry farms, and is worthy of investigation where excessive losses from ruptured oviducts occur.

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According to investigations conducted at the University of California (*Nulaid News*, 28:20 [April], 1951), turkeys normally lay about 60% of their eggs in the afternoon while chickens lay 60% of their eggs in the morning.

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A severe gapeworm infestation in a flock of 3,000 pheasants was successfully treated by Moynihan, *et al.*, (*Canad. Jour. Comp. Med. & Vet. Sci.*, 14:308, 1950) with barium antimonyl tartrate.

Inheritance of Egg Size

Breeding investigations conducted by the Department of Poultry Husbandry, of the University of California (*Nulaid News*, 28:20 [April], 1951), indicates that inheritance influences the size of eggs to the extent of 60%. This is considered to be a very high value as compared to the heritability of other economic factors. For example, the inheritance of shell thickness represents from 15 to 30% of all factors responsible for thickness of the shell.

In the studies on shell thickness, several interesting observations have been made. Some of these are; (1) shell thickness and shell smoothness are independent, (2) White Leghorn hens laying creamy colored eggs tend to produce thicker shells than their sisters that lay white eggs, and (3) specific gravity of fresh eggs is a highly accurate measure of shell thickness.

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Safflower seed oil meal may prove to be a valuable source of vegetable protein that can replace animal proteins as shown by research work reported recently by Kratzer and Williams of the University of California (*Poultry Sci.*, 30:417, [May], 1951). Safflower seed is now widely grown as a source of vegetable oil, and the oil meal is a by-product. It is deficient in at least two amino acids, lysine and methionine, so it is necessary to use an equal part of fish meal with the safflower meal to supply these essential amino acids.

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The duckbill or duckbilled platypus (*Ornithorhynchus anatinus*) is a mammal and not a bird as many people believe. It has a few characteristics of birds, including its duck-like bill, and has webbed feet, which in males have rooster-like spurs on the heels. The female has a distinct oviduct and builds a nest for the one to three eggs it lays. The young, when hatched, "nurse" by lapping up milk secreted by scattered mammary glands on the abdomen of the female. This queer animal is found in eastern Australia and Tasmania.

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When turkeys are to be reared on range, about one acre should be provided for each 100 turkeys.

Histoplasmosis in a Dog

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Histoplasmosis is a disease of the reticuloendothelial system caused by infection with the fungus *Histoplasma capsulatum*. The organism was first described in medical literature by Darling[1] in 1906 from tissue taken on autopsy of cases that appeared to be visceral leishmaniasis.

The disease was first described in dogs by De Monbreun[2] in 1939. Since that time over a dozen cases have been reported in dogs, as well as in cats, various species of wild animals,[3] a colt,[4] and at least one cow[5].

Histoplasmosis formerly was considered a highly fatal disease but a recent report[6] shows that of some 16 recognized cases of human histoplasmosis, six recovered. The same publication[7] reports a non-fatal case of the experimentally induced disease in a dog. The increased number of confirmed cases in animals during recent years is of importance from the standpoint of differential diagnosis as well as the public health aspect.

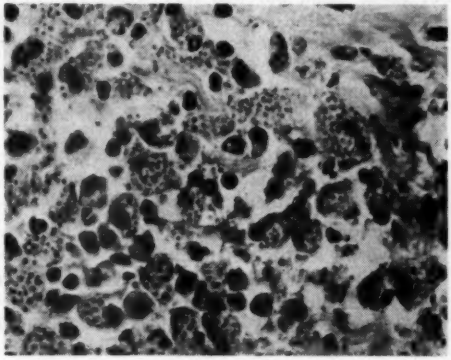
The patient subject of this report was a German Shepherd male, Baron of Retloch, born April 13, 1948, at St. Louis, Mo. The pup was obtained at six months of age and brought to Columbia, Mo.

Although the animal was very active, it never was in good condition. It would eat cow manure at almost any opportunity. Often it would vomit. Aside from this history, the owner reported that the animal had a hacking cough, especially after exercising. The appetite was always good.

During the first week of June 1950, the dog was presented at the Veterinary Clinic, School of Veterinary Medicine, University of Missouri, for rabies vaccination and a health certificate. The animal was examined and a health certificate issued prior to the owner's trip to California with the dog.

At Albuquerque, N. Mex., the dog became sick, with a thin, fetid diarrhea and vomiting. The owner thought that the illness was probably due to the change in climate, since it was exceptionally hot, or that the dog had become sick from riding in the car. There was no improvement in the condition during a three day stay in New Mexico.

Upon arrival in Los Angeles, the animal was presented to a veterinarian for treatment. Seven days had elapsed since the diarrhea had begun. The patient had a temperature of 103.5 F. and was given a bismuth preparation. The dog did not improve and was returned for treatment two weeks later. At this time a sulfonamide preparation was prescribed, but the diarrhea persisted. The dog was again presented for treatment in two weeks and was given a therapeutic dose of streptomycin and aureomycin. At a consultation with another practitioner at this time, it was decided that the diarrhea was possibly due to an allergy.



Section of lymph node demonstrating macrophages with contained *Histoplasma capsulatum*. Section made from tissue collected at autopsy by Dr. Loren Kintner.

Various constituents were eliminated from the diet, without success.

The owner returned home the latter part of August and thought the dog might possibly improve in its former environment. It was taken to the Clinic on September 4 where a fecal examination revealed a light infestation of hookworms, *Ancylostoma caninum*. A bismuth preparation was dispensed for home treatment.

On a subsequent examination the following symptoms were noted: temperature, 101.5 F.; pulse and respirations normal; fetid, watery diarrhea; emaciation; and a dull lusterless coat. The total white cell count was 22,500. Urinalysis disclosed a specific gravity of 1.035 and 3+ albumin. On the basis of findings on a differential blood count, a tentative diagnosis of lymphogenous leukemia was made.

The patient was treated parenterally with dextrose, fluids, whole blood, and amino acids in an attempt to build strength up so that an exploratory laparotomy might be performed.

On September 29, surgery was performed and the entire chain of mesenteric lymph

glands was found to be enlarged. The spleen contained a very large old infarct, the liver was slightly enlarged, and a granulomatous mass was found in the ileocecal junction which was approximately two inches in diameter and extended by finger-like projections from the intestine into the mesentery. A biopsy was taken of two of the small lymph glands. An acid-fast stain was made on one of the lymph nodules to determine if it contained *Mycobacterium tuberculosis*. One of the lymph nodes was sectioned, but no diagnosis was made.

The day following surgery, the dog ate 2 lb. of horse meat, but was very weak. An intradermal injection was made with histoplasmin and the patient observed at 48 and 72 hour intervals. The histoplasmin test was negative. Subsequent blood count confirmed the earlier findings of a large number (18%) of atypical lymphocytes.

In spite of the excellent appetite, the animal became progressively weaker and died October 12.

Postmortem examination revealed a few hookworms in the small intestine; the granulomatous mass which was noticed in the cecum when laparotomy was performed; two old infarcts in the kidney and some mild interstitial nephritis. The lungs contained areas of atelectasis and consolidation of the middle right lobe.

Sections were made of tissue taken from the lymph glands, kidney, liver, and spleen. Eosinophilic bodies were found within the cell membrane of many of the macrophages. Dr. L. D. Kintner of the pathology department diagnosed the case as histoplasmosis.

Tissue was forwarded to Dr. R. W. Menges, Public Health Veterinarian, University of Kansas Medical Center at Kansas City, Kans., who confirmed the diagnosis.

Discussion

An early diagnosis of histoplasmosis is difficult. The disease should be considered in the differential diagnosis of parasitism, bronchitis, nonspecific enteritis, allergies, tuberculosis, neoplasms, or other debilitating diseases which do not respond to treatment.

It is a granulomatous disease not limited to one specific tissue or group of organs. The history of clinical cases of histoplasmosis usually includes a dry hacking cough, irregular fever, and digestive upsets with diarrhea. As the condition progresses, the liver, spleen, and lymph glands may become enlarged. Emaciation is common, although the appetite remains normal.

An intradermal injection with a diagnostic agent is an important aid, although many animals which react to the test appear to be normal. Animals in advanced stages of the disease or in a debilitated condition do not, as a rule, give a positive reaction to the histoplasmin test.

Blood smears made from the peripheral blood and stained with Giemsa's stain may show the causative organism in some of the monocytes. Sections of an enlarged lymph node or other material taken on biopsy should be examined for *Histoplasma capsulatum* which appear as small, eosinophilic oval bodies in the mononuclear cells. Occasionally budding organisms can be seen. Cultures can be made from blood, lung, lymph nodes, liver, or spleen on glucose broth or on blood agar and Sabouraud's glucose agar. Such cultures should be kept at least one month as the organism is slow to grow on artificial media. Saline suspensions of a culture may be inoculated intraperitoneally into guinea pigs or mice. Tubercle-like lesions appear in the visceral organs and *H. capsulatum* may be found in the macrophages.

REFERENCES

1. Darling, S. T., *Jour. Am. Med. Assn.*, 46:1283, 1906.
2. De Monbreun, W. A., *Am. Jour. Trop. Med.*, 19:565, 1939.
3. Emmons, C. W., *Am. Jour. Pub. Hlth.*, 40:436, 1950.
4. Richman, H., *N. Am. Vet.*, 29:710, 1948.
5. Menges, R. W., and Kintner, L. D., Unpublished report.
6. *Pub. Hlth. Rept.*, Aug. 4, 1950.
7. *Pub. Hlth. Rept.*, May 1950.

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Plans have been completed for a new national headquarters building and research laboratory in Atlanta, Ga., for the Communicable Disease Center of the Public Health Service, Federal Security Agency.

The new Center, a group of six buildings to cost an estimated $12,500,000., will furnish facilities for a number of projects related to wartime protection of the civilian population, as well as to peacetime public health.

Projects closely connected with national defense include biological warfare defense studies and training, toxicological research on chemical warfare agents, and field training of certain military personnel in sanitation. All branches of the CDC will be housed here, which will aid in the coordination of the service.

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Canine hepatitis is widespread in the United States.—*J. A. Baker, D.V.M.*

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

THE INFECTIOUS DISEASES OF DOMESTIC ANIMALS WITH SPECIAL REFERENCE TO ETIOLOGY, DIAGNOSIS, AND BIOLOGIC THERAPY, by *William A. Hagan, D.V.M., D.Sc.*, Professor of Bacteriology and Dean of the faculty, New York State Veterinary College, Cornell University, Ithaca, and *Dorsey W. Bruner, D.V.M., Ph.D.*, Professor of Bacteriology, New York State Veterinary College. 2nd edition, 920 pages, 154 illustrations. Comstock Publishing Co., Inc., Ithaca, N. Y., publishers. — Price $8.00.

The first edition of this authoritative work has sold out five reprintings since its publication in 1942. Such reception attests its popularity not only as a textbook for students, but also as a reference work for practitioners. This has stimulated the authors to bring material up to date.

The work is larger by 265 pages and has been completely rewritten with the assistance of a junior author.

The original plan of the book has been preserved. Discussions treat of the causative agents of disease in detail much as would be expected of a textbook of bacteriology. The book is more, in that in it appear discussions of other disease-producing agents than bacteria and because the character of the disease in the host animal is considered.

Morphology and staining characteristics and cultural features of organisms, incidence, and pathogenicity are discussed in more detail than are symptoms exhibited by affected animals or postmortem lesions. Likewise, immunity by biological products is briefly considered and only brief mention is given the recommended therapeutic regimen. These facts do not detract from the value of the treatise. It was not intended as a textbook on either pathology or therapeutics. One new chapter, a brief one on chemotherapy, has been added, as well as sections giving mention to chemotherapeutic agents and antibiotics, frequently with citation to references dealing with their use.

The appearance of a revived edition of this book, enlarged, and up-to-date, is timely.

QUESTIONS AND ANSWERS— VETERINARY, edited by *J. V. Lacroix*, D.V.S., and *H. Preston Hoskins*, V.M.D. 210 pages, cloth bound. American Veterinary Publications, Inc., Evanston, Ill., publishers, 1951.—Price $4.00 in U. S.; $4.25 elsewhere.

A wealth of information is contained within the covers of this book. Replies by 138 authorities to more than 500 selected questions are taken from those that have appeared in the Questions and Replies columns of *The North American Veterinarian*.

Contents is divided into seven chapters. Questions pertaining to animal species are grouped under separate chapter headings. An index, by subject, assists the reader to find answers to specific questions as posed by an inquirer under a subject head. These are brief and are written as direct replies to the questions and not as dissertations on the subject of the question.

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CIRCUS DOCTOR, by *J. Y. Henderson*, D.V.M., Chief Veterinarian of the Ringling Brothers and Barnum & Bailey Circus, and *Richard Taplinger*. 238 pages. Little, Brown & Company, Boston, Mass., publishers, 1951.—Price $3.50.

This is not a veterinary textbook but an interesting story of the life of a veterinarian with the "greatest show on earth", Ringling Brothers and Barnum & Bailey Circus.

Animal lovers of all ages and those who are thrilled by the circus performance will find in this story an enjoyable evening's entertainment. Some idea of the demands made on the veterinarian and the requirements of versatility are woven through the story as experiences are related of handling sick and injured animals of many species.

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Erratum

The June 1951 issue of VETERINARY MEDICINE carried a review of the book Diagnostic Methods in Veterinary Medicine, by Dr. George F. Boddie, in which the price was incorrectly quoted as $4.00. The correct price of this book is $5.00.

VETERINARY ITEMS OF INTEREST

Entertoxemia is the no. 1 headache of sheep growers.

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Antibiotics are chemotherapeutic agents derived from the metabolism of organisms.

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Loss in milk production attributed to shy breeders is estimated to amount to $28,000,000. annually in Wisconsin.

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Infection spread from one hog lot to another by the boots and garments of attendants and visitors is the concern of enlightened growers.

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The variable antigenic response to *Bacillus coli* is the limiting factor in the use of bacterins in calves as a preventive measure against white scours.

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Infected anal glands in dogs may provoke a persistent dermatitis starting at the perianal region and extending to adjacent parts. Recovery regularly follows surgical removal of these glands.

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The first magazine published by the students in an American veterinary college made its bow in 1896. It was titled *The Veterinary Herald* and was published at the Chicago Veterinary College.

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The dairy industry is destined to shift from a fat standard to a total solids standard. The value of quality whole milk and the non-fat milk solids in nutrition makes the fat standard untenable.

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Failure to demonstrate Negri bodies in prepared slides from suspect cases of rabies does not eliminate the possibility of infection being present. Some rabies virus strains do not produce Negri bodies. In all such cases, clinical observations must be evaluated in making a diagnosis. Animal inoculation trials may confirm rabies in cases where inclusion bodies could not be demonstrated.

Rumen bacteria vary according to roughage supplied the ruminant animal.

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Leptospirosis should be considered as a possible cause of hemoglubinuria in cattle of any age.

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Approximately ⅓ of all dogs infected with canine hepatitis develop corneal opacity ten days after recovery.—*J. A. Baker, D.V.M.*

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Injections into mice of liquid contents of the ileum and cecum of sheep dead of enterotoxemia give positive confirmatory diagnosis.

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Carrier animals in the breeding herd may be responsible for outbreak of atrophic rhinitis in pigs. Such adult carriers exhibit no clearly defined nor constant symptoms of infection.

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There is no evidence that *Leptospira pomona* isolated from cattle in the United States is transmissible to man; though strains of this organism in Europe are of public health significance.

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Because of the insidious nature of infectious atrophic rhinitis of swine, infection may be present on the premises for several years and escape notice of attendants.

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American dog owners spent more than $150,000,000. on prepared foods for their canine pets in 1950. A recent national survey shows that sales jumped approximately 25% between 1947 and 1949, and that dry dog food accounted for 56% of the total volume in 1949.

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Approximately 8,000,000 lb. of Mexican canned beef and gravy are being offered to exporters by the Commodity Credit Corporation. This quantity represents all remaining of purchases in Mexico by the CCC. Total sales of the Mexican canned product by the USDA are reported to approximate 220,000,000 lb.